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PROVIDING A WORKING KNOWLEDGE OF STANDARD COSTS FOR PLANT SUPERVISION

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If the standard cost system is a private affair of the accounting department, it will render scant benefit to the company, and its reporting requirements may be a source of annoyance to operating personnel. The present paper suggests a procedure, embodied in a three-session course of instruction, to impart to plant supervision at least a general understanding of what standard costs are, their immediate control uses, and their informational services to top management.

THE people who make or break a standard cost system are often the manufacturing management group including foremen, inspectors, production managers and others. If this group thoroughly understands the principles on which the cost system is based and how it affects them in discharging the duties and responsibilities of their individual positions, a long step has been taken in the right direction. It has become necessary that factory management personnel possess, besides the technical qualifications and experience to fulfill their positions, an appreciation of costs. That is to say they must have an understanding that the welfare of the company, their own welfare, and that of the men under them requires the company to keep on a firm financial basis. The control of costs is the most important factor in achieving this goal.

Objective: Confidence in the Standard Cost System

Consequently, time should be devoted to educating this segment of management in a thorough understanding of the standard cost system, what it is and what it will do. It will be well to keep in mind that no system ever operated a plant. However, the proper system will give dependable and accurate information to assist management in making decisions necessary to plant operation. A standard cost system it not unlike a newspaper in that it provides a report on what has happened and, based upon this information, management is in a position to more advantageously plan future action, make day-to-day decisions, and accurately forecast what the results

will be. For this reason top management may appropriately take a real interest in giving the manufacturing management group full knowledge of how the standard cost system operates and why it is important to keep it current and complete. It therefore behooves the controller, if he intends to make the system more than a compilation of figures, to embark on a program of instruction in order to create understanding and confidence in the shop in one of management's most important tools.

There are various ways of accomplishing the educational objective. This paper will be confined to an outline of an instruction program designed to instill in the manufacturing group a knowledge of what its members can do for the standard cost system and what the standard cost system can do for them. The subject may be covered under three heads which operating supervision will at once recognize as pertinent. They form suitable divisions of the topic for treatment one at a time in a three-session course:

1. What is a standard cost system?
2. How will it help factory management to do a better job of plant operations?
3. What will it tell top management about the kind of a job which is being done?

What Is a Standard Cost System?

In discussing what a standard cost system is, the presentation should begin with the fundamentals. It may be pointed out that standard costs, living up to their name, express the existence and logical operating use of standards—preferably engineered standards—to be met for each operation and each item of material adding to the cost of making a product. These standards are generally based on the following:

1. A standard established price for raw materials and purchased parts and quantity standards for their use.
2. A labor cost for each of the company's productive operations, based on a standard hourly wage rate and a definite expected and attainable rate of production from each employee.
3. A standard burden or overhead rate generally expressed as a per cent of direct labor.

It is worth while to take time to demonstrate that the basis upon which the standards have been established is both reasonable and accurate. This may be a point of hidden doubt in the minds of operating personnel. An explanation in detail of how the standards were obtained is generally best accomplished with the aid of blackboard illustration through a topical outline, similar to the following:

1. Standard material cost factors
   a. Cost per unit of material.
   b. Number of units required.
   c. Scrap allowance.
   d. Number of operations required.
   e. Scrap and re-work allowances.
2. Standard labor cost factors
   a. Rate per hour of labor.
   b. Time study time per operation.
   c. Allowances given in time study.
3. Standard burden rate factors
   a. Cost of general overhead.
   b. Cost of salaries.
   c. Cost of indirect labor.
   d. Basis of overhead pro-ration

There may be some surprise at the number of points of general interest which a simple sketch of the subject, like the foregoing, will bring up. In this connection, scrap allowance, personal allowance in time studies, and pro-ration of overhead may be quickly noted.

The picture with which the outline may be clothed in the course of the lecture may be more concretely developed if, as an example, the standard cost of an item actually in production, one with which the group is thoroughly familiar, is covered. When illustrating the standard cost system in this fashion and explaining what it will accomplish, a lasting impression can often be made by going through the steps of comparing standard and actual costs for a given period. Starting with information as to the specific number of parts produced during a period, the narration may include a rapid but not cursory story of how standard direct labor costs, standard burden, and standard material cost, multiplied by the pieces produced, gave the total standard cost to produce these parts and why this total soundly represents what they *should* have cost. Comparison of these costs with the actual costs for the same period, with indication of where direct material and labor variations occurred and the manner in which over-or-under-absorption of burden was determined should be worked into the narrative.

Some points make themselves. What excessive scrap or waste will do to material variations is impressively stated with little effort. A simple summation of this brief session of the instruction program may be made by pointing out that the standard cost is par for the course, that the results may break par or go over par and that, in either case, they will indicate the kind of a job that is being done.

How Do Standard Costs Serve Operating Supervision?

The next session—the second of the projected series of three—should be directed to those present in terms of their own problems. The material offered should explain just what the standard cost system will do in assisting foremen and others. It should be remembered that the group's interest in standard cost is not in the accounting technique involved but in the controls it provides and the assistance it will lend in discharging responsibilities in the shop. The initial interest aroused should not be disappointed.

It may be that previous cost systems, if they were of the job order type, accumulated all costs over the entire period of producing an item and merely gave a picture of the total amount spent to produce the job in question and gave even that at a late date. It can be pointed out that information of this type does not give management an indication of what the job should have cost. Consequences of not having the data at hand should be stressed. The situation related to review of past performance in these circumstances may be touched on for painful memories of how difficult it was to know where the fault for apparent high cost work might lie and where to start on a remedy. It can also be commented that the difficulty of repeating the circumstances of low cost performance was equally difficult.

In this lecture, it should be driven home to the group—but it cannot be unless it truly reflects the administration of the standard cost system—that standard costs are not only a tool for top management but also a tool for the manufacturing group. Through reports to foremen and others, it becomes their own measurement, both of the kind of a job they are doing in their own departments and the job the manufacturing team as a whole is doing throughout the plant. However, so reported, it is properly an aid, not a prod. By utilizing the information obtained through the standard cost system operating supervision will know where to look for cost leaks, where to spend time and where to apply remedies.

If top management holds formal talks about efficiency on the job, higher production, reduction of scrap and rework, lower cost, etc., the comments are likely to go in one ear and out the other. If the discussion centers on concrete needs felt in the daily effort to do a good job and implement company policy, the session will have interest. All foremen are interested in the whole gamut of costs from power utilization to scrap minimization. They will take all the help they can see.

Managerial Uses of the Standard Cost System

To the third and last session falls the task of imparting the consciousness that through standard costs, management keeps before it the picture of the effectiveness of production efforts and the effectiveness of supervision personnel. Here again, there is no need to raise the spectre of a day of judgment. On the contrary, use of standard costs by top management can draw it closer to, and impress it with, the key position of the manufacturing management group which often handles 65% to 85% of the dollar cost of a product and is directly responsible for the variances which may show up in the following classifications:

1. Material—
   a. Material yield
   b. Scrap
2. Direct labor—
   a. Failure to meet standard
   b. Rate allowances
   c. Waiting time
   d. Excessive re-work
3. Burden—
   a. Faulty processing
   b. Supplies
   c. Setup
   d. Breakdowns
   e. Rework
   f. Extra operations

There are, of course, many other excess costs which the manufacturing staff controls. This final talk of the trio of indoctrination sessions may well include mention of any characteristic of the operation, with significant amounts. The truth that only on the production level can these excess costs be curbed is a healthy one to which emphatic utterance may be given. Neither should there be any hesitation to give figures to plant management and supervision. An important job of top management is to create in the members of this group the feeling that they form an important part of an important team with an important job to do.

Guidance for All Levels of Management

It will be realized that three meetings do not afford the time necessary for detailed instruction in standard costs. Perhaps this is just as well. The object is to open the door to real co-operation. We do not want to talk it shut. We just want to make clear the company-wide potentials of a standard cost system. Some of these are:

1. It provides the foreman, production manager, etc., with a yardstick for gauging his own performance.
2. It gives the department head a yardstick for measuring employee performance.
3. It allows the department head to be fair with employees, not penalizing them for non-productiveness that is *not their fault*.
4. It provides a guide to direct the work and thus make each department more efficient.
5. It allows the department head to defend his judgment to the men and to management in selecting the employee assignments.
6. It puts the foreman in a position to receive tangible, measured, and definite information on the production problems of his department.
7. The department head can, by a thorough understanding of the system, receive the benefit of knowing when any part of the work is in hand, so as to not require his concentration. He can also *know* what the problems are that *he* is responsible for and *how important* they are in dollars and cents. This puts him in a position to do a quicker and better job of correcting them.

A well-operated, thoroughly-understood standard cost system is more than an accounting system. It is a cost control system, a production system, a planning system. It is the plant's report card.

INTEGRATION OF STANDARD COSTS WITH ENTRY AND CLOSING ROUTINE

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Those who are familiar with but do not use standard costs may not immediately visualize the relationship of a standard cost system and variance development to the gathering, summarization, and account distribution of current transactions in material, labor and other plant operating factors. The accompanying case study, which also deals with the establishment of the standards used, bears out the belief that standard costs tend toward efficiency and economy in record-keeping in addition to the more widely-known benefits.

NOT the least of the requirements of a standard cost system is that it form an accepted part of the accounting routine. This means that it must achieve its useful results, or at least provide the information for analysis, within the monthly cost entries. If properly installed, a standard cost system can also do much to ease the mechanics of monthly closings.

The operation of the system here presented is extremely flexible. As the actual and standard costs of production are accumulated, sufficient detail is maintained so that historical costs of all detail and major parts can be developed after the monthly closings have been made, and the variances charged off. Subsidiary cost records provide columns for actual as well as standard costs. (The standard costs are used for reconciliations and trial balances and the actual costs are considered comparative or statistical data.) A distinction is made at certain points, between shop standards which may change during the year, and cost standards which do not, and on which cost of sales entries are based.

Thus the inventories of raw materials, work-in-process, and finished parts are valued at standard costs. When the product is shipped, standard cost of sales is recorded. This standard cost of sales, plus or minus over or under-absorbed burden, provision for inventory adjustments, and variances from standard, equals the manufacturing cost of sales at actual. For a quick comparison

the average unit actual cost of any part or assembly can be computed by applying to the unit standard cost the over-all ratio of actual costs incurred to the standard costs.

The principal steps in the operation of the system may be described as follows:

1. When raw materials are purchased, the difference between the invoice cost and the standard cost is recorded as material purchase price variance.
2. When raw material is put into production, the standard cost of the material requisitioned is charged to the work-in-process account.
3. When the material is worked on to produce the fabricated items and the direct labor payroll is recorded, the difference between the actual labor cost and the shop standard labor cost is recorded as a labor cost variance. The variances computed for assemblies, parts, etc., are classified to causes, as follows:
   (a) Work performed at rates other than standard for the operation.
   (b) Changes in efficiency level.
   (c) Re-work and excess costs.
4. When the actual direct labor cost is recorded, the manufacturing overhead expenses are absorbed by applying the predetermined standard percentage to the direct labor dollars.
5. When parts are scrapped, the standard cost of the part (through the last operation completed) is credited to the work-in-process inventory and charged to the cost of scrap variance account.
6. When parts or products are completed, they are delivered to finished stores or to the assembly department. The difference between the shop standards recorded when the work was performed and the finished parts cost standards is charged or credited to shop standard vs. cost standard variation when the parts or products are completed.
7. When parts are purchased and delivered to finished stores, the difference between the invoice cost and the standard cost is recorded as a material purchase price variation.

8. When subassembly and final assembly operations are performed, the difference between the labor cost incurred and the standard labor cost of assembly production is recorded in labor cost variances.
9. The bill of materials listing the component parts and assemblies of the products shipped is priced at cost standards and is credited to the detail inventories and charged to the proper contract ledger sheet. Any direct costs over and above the standard value, such as special tooling, supplies, packing and shipping costs, etc., are added to the standard costs at this point in order to arrive at the total cost.
10. When shipments have been completed, the total cost of the sales order is credited to the contract ledger and charged to cost of sales.

The raw material and finished parts inventories are valued at cost standards. The work-in-process assembly inventory likewise is valued at cost standards. The work-in-process parts inventories are valued at shop standards.

Accounting For Raw Material and Purchased Parts

The inventory control department maintains stock records of raw material, fabricated parts, and purchased parts. Detailed records are kept in the following inventory accounts:

1. Productive raw material, priced at standard costs.
2. Productive purchased and fabricated parts, priced at standard costs. Stock record cards for fabricated parts show the material, labor, and overhead cost elements.
3. Emergency service stock, priced at standard costs.
4. Sundry inventories at actual costs.

Procedure Reflecting Receipt and Storage of Parts and Materials

When purchased parts and raw materials are received, the quantity is checked and listed on the vendor's packing list. The packing list is compared to a copy of the purchase order and a receiving report prepared. Copies are forwarded to purchasing, materials control and inventory control sections. If, after inspection, goods are not acceptable, the salvage section makes a determination as to ultimate disposition of the goods and, if they are found to be reworkable, a vendor's re-work ticket is prepared. Any re-work

labor is charged to the vendor's re-work ticket. Material which inspection has been found to be satisfactory on inspecting is forwarded to the appropriate storeroom. One copy of the receiving report is retained by the Inspection department and a copy travels with the material to the storeroom. The foregoing receiving procedure applies alike to raw materials and parts purchased in a finished condition. The following procedure relates to handling of purchased parts and to finished parts manufactured. It also applies, in a large part, to raw materials, with modifications to be noted.

At the storeroom for finished parts stores the goods are received and recounted and the receiving report is stamped with the quantity, date and name of the stores clerk. The information on the report is posted to a material received in stores list which is, in turn, the basis of a posting to a material receipt tabulating card. Parts manufactured in our own shop are sent to finished stores accompanied by a descriptive ticket and are listed and posted in a similar fashion.

For items received from outside vendors, a copy of the receiving report is sent to the inventory control section where a control of goods received is maintained. The first copy of the receiving report is sent to the inventory control section by the receiving department as soon as the material is received. It is entered on the control at that time. Subsequently, when the fourth copy of the receiving report arrives from finished parts storeroom, it is noted on the control, thus accounting for the passage of the material into company stores. Generally, a sample of goods received from outside vendors is tested. The quantity used for this test, which involves destruction of the items used, is noted on the final copy of the receiving report and becomes part of the journal entry in which the standard cost of the test pieces is charged to a scrap variance account, with a credit to the inventory account involved.

Upon receipt in the storeroom, raw material stores are subject to a slightly different procedure from finished stores. As indicated earlier, the procedure up to the point at which the material enters the storeroom is the same. There the receipt of the material is posted to a stores record card maintained in the stores department. A copy of the receiving report is sent to the inventory control section where the procedure is again the same as for finished parts stores. For material disbursed to the shop, the stores department prepares a material requisition on a tabulating card. This shop

material requisition serves as a disbursement card. These requisitions are then forwarded to the inventory control section for checking. In order to expedite the tabulating work, the part number codes are applied and the requisitions are then sent to the tabulating for further processing.

Setting Up Accounts Payable and Working the Price Variance

The stores records in the inventory control section are maintained on visible card files. The first copy of the receiving report forms the basis for the entry of the quantity, purchase order number, and the receiving report number on the top half of stores record card. It is then forwarded to the accounts payable section where it is compared to the vendor's invoice and a journal entry prepared to a debit the inventory control account for the material invoiced and to credit accounts payable account at actual cost. In exchange, the duplicate copy of the invoice is sent to the inventory control section by the accounts payable section. Periodically, the inventory control prepares copies of the entries to the various inventory control accounts. The duplicate invoices are checked with accounts payable records to see that all invoices have been received.

The inventory control section has on hand a catalogue of all material standards. The standard unit cost is posted to the duplicate invoice. At the end of the month, a variance schedule is prepared by part number for each invoice whenever the actual cost is greater or less than the standard cost. However, as the invoices are received, they are entered on the stores record card at actual cost, showing quantity, unit actual cost and total actual cost. This information with its adjustment to standard as described below, provides a complete record of every productive material purchase, making it possible to compare actual and standard values at any time. This is extremely valuable in setting sales prices and in determining the best source of supply.

At the end of the month, the schedule is totaled and the total standard cost is compared with the total actual cost to arrive at the amount of the purchase price variance. From this information, a journal entry is prepared. There is a debit or credit to material purchase price variance account with an off-setting debit or credit to the proper inventory account. This has the effect of adjusting the inventory control account to standard cost. Also, from the variance schedule, the details of the variance are posted to the

stores record cards to adjust the parts to standard. Therefore, at the end of the month, a trial balance of the stores record cards equals the balance in the inventory control accounts.

Tabulating Procedure: Charging Work in Process at Standard

As with the receipts of material, disbursements of stores items are recorded on tabulating cards. The receipt and disbursement cards are forwarded to the tabulating section which maintains balance forward cards to support the physical inventory of material. The balance forward cards are collated with receipt and disbursement cards in order to prepare new balance forward cards. From the new balance forward card, a "daily report of activity" is prepared. This report is sent to the inventory control section for checking and to the stores section for their records. At the same time, the tabulating section cuts a duplicate disbursement card. This duplicate disbursement card is sent to the cost department where accounting code is inserted. It is then returned to the tabulating section for further processing.

Key punch requisition cards for disbursement of material from raw material stores for finished stores are the basis for preparing the monthly material distribution entry. These requisitions show the part number and part name, the quantity disbursed, and the assembly or charge number on which the material is to be used. In addition, the cost department has coded each requisition with an accounting code letter which indicates the control and subsidiary ledger to which the costs are to be transferred.

The tabulating section has on hand a file of master price cards for raw materials, purchased parts, and fabricated parts. These master price cards are prepared by the inventory control section and show the part number and the unit standard costs of each item. The disbursement cards are collated with the master cards and the total quantity disbursed for each part is multiplied by the unit standard cost to arrive at the total standard cost of material disbursed. At this point, all disbursement cards are sorted by date and part number. For verification purposes, a list of the disbursement cards is prepared by part number showing the quantity, standard cost, date, and charge number. This listing is sent to the inventory control section for correction and any changes are reported to the tabulating section. The listing is then re-run, if necessary, and provides the basis for crediting the detailed inventory records. A tabulation of the cards, sorted by ac-

counting code and charge number, is called the monthly material cost report and is sent to the cost department for posting to the work-in-process ledgers. These tabulating reports provide the information necessary for the preparation of the journal entry which charges the work-in-process accounts and credits the appropriate inventory accounts at standard cost.

Minor Material Variances

Three other variance entries relating to materials are prepared by the inventory control section. In the first of these, goods which have been considered as unacceptable by the salvage section are billed to the vendor at actual cost. The second entry reflects the scrapping of materials. It relieves the inventory of the standard cost of scrap and charges material, labor, and overhead scrap variations accounts. The third entry is for purchased parts for which a manufactured standard has been set. Variance is measured against this standard.

Accounting for Direct Labor

Clock cards are used to accumulate the elapsed time worked by each employee. They are also the basis for preparing the payroll. The labor distribution card, on the other hand, is the means by which the time worked by the employee is charged to the various accounts. In direct labor departments, a labor distribution card is prepared by each hourly employee whenever his job changes. The timekeepers verify that the elapsed time shown by the clock cards is supported by labor distribution cards. They also verify that the labor distribution cards are properly coded.

Preparing the Payroll

The clock cards are forwarded to the tabulating section where the information which they bear is recorded on a key punch tabulating card. This card is called the employee's weekly earnings card. The tabulating section has on file master rate cards for each employee. A file of summary deduction cards which contain a record of each employee's payroll deductions is also maintained. By matching these cards, the tabulating section produces the following which are forwarded to the payroll section:

1. A weekly departmental summary which lists by department the hours, earnings, social security taxes, and the amount of net earnings before company deductions. This

summary is the preliminary control for the payroll register and provides additional information to that contained in the weekly payroll register.

2. A weekly payroll register which lists for each employee, the hours, earnings, tax deductions, company deductions, and amount of net earnings.
3. The individual employee's check and stub.

Tie-In of Distribution Cards and Clock Cards

After the timekeepers have matched the labor distribution cards with the clock cards, these are sent daily to the tabulating section where a daily efficiency report by department and individual employee is prepared for factory management. The daily efficiency report is a tabulation of the production performed by the direct workers. Through the medium of the tabulating operation, each part or job which an operator has worked on is recorded and the total standard hours produced are compared to his elapsed working time. The labor is further classified and coded as to whether it was setup, standard production, rework, or other type of work. In the event that idle time is reported, it is classified as to cause, i.e., waiting for material, waiting for tools, machine breakdown, etc. All other expense charges are also tabulated. This record is available the day following the operations to which it applies.

The hourly rate of each employee, taken from the master pay rate cards, is applied to his labor distribution cards. At the end of each week, the labor distribution cards are sorted by employee number and are collated with the weekly earnings cards. A listing is prepared to insure that the hours and dollars on the labor distribution cards agree with the clock card totals. This operation is called "zero balancing." It confirms to the cost accountant that every dollar paid out as wages has been accounted for as labor distributed to a specific job or classification. Differences are reconciled by the payroll section.

Initial Summarization of Distribution Cards

At the end of each week the labor distribution cards are separated into hourly and salary groups. Each group is sorted to classify the information in the following order:

Accounting code	Working department
Charge number	Home department

The cards with specific product codes are further sorted by product cost distribution code as follows:

1.	Set up time	
2.	Production time	Standard earned time
3.	All other distribution codes	Non-productive and expense i.e., rework, etc.

The hourly and salary labor distribution cards are then processed together and a summary card prepared for each group of cards, in which classifications remain constant. A tabulation of the summary cards is produced each week showing department numbers, actual hours, and regular earnings in actual dollars. This tabulation is matched with a payroll work sheet showing the same classification of information, in order to prove the weekly regular earnings for departments. After this proof, all summary labor distribution cards are sorted by accounting codes. For specific product codes, the total standard hours are multiplied by the applicable standard labor rate to arrive at the standard labor cost.

All standard labor on the various products carries the same standard overhead rate, no matter where the labor is performed. The calculation of standard overhead is made by the cost department. Predetermined master overhead rate cards are maintained by the tabulating section. The labor distribution summary cards (on which overhead is applied) are collated with the master overhead rate cards to multiply the actual labor cost by the overhead rate, thereby obtaining the applied overhead amount.

Utilization of Labor Distribution Summary Cards

By using all summary labor distribution cards for the month, the tabulating section is able to produce reports which form the basis of the journal entries distributing the entire payroll. These reports are sent to the cost department and the payroll section, where the entries are prepared. The tabulating section sorts the summary labor distribution cards for the month by accounting code, segregating specific product codes from the classification "all other," which is further sorted into departmental expenses and "other codes." The summary labor distribution cards are used to obtain two tabulations of the charges which they represent: (1) by department and (2) by charge number. These two tabulations are sent to the payroll section and the cost department. The "other codes" are tabulated by accounting code,

charge number, and working department to produce a tabulation which is also sent to the cost department. In this case, each code is a separate tabulation.

The specific product codes are sorted by cost distribution code and charge number. A tabulation is sent to the cost department for detail posting to the work-in-process ledgers as part of the journal entry which distributes the factory payroll control account.

Tabulating produces three monthly summary tabulations from the summary labor distribution cards:

1. *A tabulation of standard work in standard departments.* This means a tabulation of work done on specific product codes. The tabulation shows standard hours, standard cost, actual hours, actual cost, and actual overhead amount.
2. *Another tabulation is prepared by these product codes which is called standard work in nonstandard departments.* The same information as in (1) is shown, but it is classified by accounting code and overhead code. Both of these tabulations are sent to the cost department to be used in preparing the factory payroll distribution journal entry.
3. *A tabulation for all codes other than specific products.*— This covers nonstandard work except departmental expense codes. This tabulation shows actual hours, actual cost and actual overhead amount, classified by accounting code and overhead code. The tabulation is sent to the payroll section and becomes part of the basis for the journal entry which distributes the entire payroll. The total actual dollars from the three tabulations, plus the total of the detail departmental expense code tabulation equals the gross payroll.

Labor and Overhead Variances Developed

The factory payroll is the gross actual payroll on production, for which standard costs have been established. The two tabulations for standard work on specific product codes received by the cost department from the tabulating section are the basis for factory payroll distribution. Using the information shown on the tabulations, the cost department computes the standard overhead by multiplying the standard labor by the standard overhead percentage. The tabulations show standard hours, standard cost, actual hours, actual cost and actual overhead. From this data, the following variances are computed:

1. Labor rate variance—
   Represents the difference between the actual labor cost and the actual hours multiplied by the standard labor wage rate.
2. Labor efficiency variance—
   Represents the difference between the standard labor cost and the actual hours multiplied by the standard labor wage rate.
3. Overhead rate variance—
   Represents the difference between the actual overhead cost and the actual hours multiplied by the standard labor rate and then multiplied by the standard overhead rate.
4. Overhead efficiency variance—
   Represents the difference between the standard labor multiplied by the standard overhead rate and the actual hours multiplied by the standard labor rate and then multiplied by the standard overhead rate.
5. Labor nonstandard department work on production variance—
   Represents the difference between the actual labor cost and the standard labor cost of production work which was performed outside a production department.
6. Overhead nonstandard department work on production variance—
   Represents the difference between the actual overhead cost and the standard labor cost multiplied by the standard overhead rate for standard work which was performed outside a production department.

The total standard labor cost of production is charged to work-in-process account. The standard labor cost plus or minus the labor cost variances is equal to the factory payroll control account. The information on the two tabulations is classified by accounting code and by overhead classification. This enables the cost department to post totals to the work-in-process controls, and to credit the overhead applied account by overhead classifications.

The preparation of the factory or standard payroll distribution journal entry by the cost department involves an adjustment to the cost of products on which the element of incomplete units in work in process is involved. An inventory adjustment is made to

convert the reported standard cost of assembly labor to the "production standard cost." For this purpose, at the end of the month, a physical inventory is taken on a percentage of completion basis of all assemblies in process. It is priced at the cost standard hours times the standard pay rate. In order to compute variances applicable to assembly work the number of assemblies and subassemblies shipped each month is priced at the applicable cost standards. The total thereof is added to the closing inventory. The opening inventory is subtracted from this total to arrive at the standard cost of assembly production for the month. The difference between the standard cost of assembly production as determined by the inventory method for labor and overhead and the actual labor and overhead recorded on the tabulation of the assembly labor distribution cards, is the labor variance applicable to assembly production.

Entries for Other Than Standard Labor Operations

The payroll department distributes all nonstandard labor. A tabulating run of nonstandard work plus the detail of departmental expense is the amount distributed. This journal entry books the gross payroll by distributing all nonstandard labor to final account and the remainder, the gross amount of the factory payroll, to the factory payroll account. The final payroll summary is the gross payroll for the entire plant for the month. The amount which is charged to the factory payroll account is derived by subtracting the nonstandard labor from the gross payroll shown on the final payroll summary. The payroll section, using the appropriate accounting code, develops the vendor's rework variation. The labor and overhead involved in rework is charged to the rework variation accounts for labor and for overhead.

The payroll section using the final payroll summary developed from clock card information, prepares the following journal entries:

1. The accrual of the employer's portion of Federal old age benefit and survivors insurance, Federal unemployment insurance and state unemployment insurance taxes.
2. The monthly deduction entry which charges accrued salaries and wages, the offsetting credits going to various payables i.e.: income tax withheld, accrued F.O.A.B., accrued state unemployment insurance, etc.

Accounting for Products

For control, inventory, cost of sales, and billing, it is necessary that charges to work-in-process be maintained by product and in some detail. The costs of direct material, direct labor and applied overhead incurred in the course of production are posted to work-in-process cost sheets. Separate cost sheets are maintained for each part number fabricated for a specific product. The standard cost of materials requisitioned is posted to each cost sheet by part number. The direct labor costs are posted to the work-in-process cost sheets as follows:

1. Actual and standard hours
2. Total actual dollars
3. Standard dollar amounts for setup, production and rework and excess costs.

Bases of Charges to Cost Sheets

The charges to work-in-process for material, and hence to the cost sheet, are priced at cost standards. The charges for labor and overhead are stated at the shop standard values prevailing when the work was performed. Since time studies are being made continuously, the shop standards are subject to change during the month. To offset the effect of charging the work-in-process accounts at different shop standards during the month, an inventory adjustment is made at the end of the month.

The opening balance on the work-in-process cost sheet at the beginning of the current month is priced at the shop standards prevailing at the end of the prior month. The input of labor and overhead has been made at varying shop standards throughout the month. The relief of the work-in-process, which is entered on the detail cost sheet at the end of the month, is at the shop standard existing at that time. The opening balance, plus the input, minus the relief, gives a tentative closing balance. This tentative closing balance must be adjusted, as it is derived in terms of mixed standards.

This is accomplished by a definite procedure. An inventory is taken at the end of each month by part number and operation number. The number of units at each stage of completion is priced at the shop standard existing at the end of the month. The inventory is divided into setup and production elements in the same manner as the standard labor is reported and recorded on the work-in-process cost sheets. The difference between the inventory

valued at current shop standards and the tentative closing balance is charged or credited to the variance account called "changes in shop standards," for labor, and for overhead. Thus, the closing balance on the cost sheet is priced at the shop standard existing at the end of the current month.

The amount of shop standard costs for material, labor and overhead which has been credited to the work-in-process cost sheet for finished units is compared with the cost standards for the finished units. The difference between the current shop standards and the cost standards is charged to the variation account called "shop standards vs. cost standards", for material, labor and overhead. The charge to finished stores, upon transfer of the completed item to it, is made at cost standards. If the part is transferred to assembly operations, the charge is likewise at cost standards. Charges to assembly work-in-process are at cost standards for material, labor, and overhead. The labor charged thereto at shop standards, is adjusted by an inventory method to a cost standard as has been described. The overall effect is to charge assembly work-in-process at cost standards, "excess" costs, scrap variance.

For most products, the standard cost of rework and other excess costs, as recorded on the labor distribution card, are cleared through the respective work-in-process accounts and charged to rework and excess costs variance for labor and overhead. In the case of some items, a certain amount of rework is considered as standard work. It is only the excessive rework over and above the standard amount which is charged to the variance accounts. These excess rework costs are determined by comparing the work-in-process tentative closing balance with the month-end inventory priced at the current shop standards.

During the course of manufacture, parts are subjected to process inspection. Pieces or assemblies rejected are held on inspection "hold" tickets for salvage disposal. When material or parts are scrapped a copy of the hold ticket is sent to the cost department. The work-in-process inventory is relieved at the same standard that the material or part is carried in the account. These standard costs are charged to the variance accounts called cost of scrap for material, labor and overhead.

Accounting for Shipments

Copies of all sales orders and sales order supplements are received in the accounting department. The accounts receivable department maintains a file of these sales orders which is used in the preparation of invoices and in recording shipments and unfilled orders. Copies of sales orders are received in the cost department and are used in the preparation of summary cost ledger sheets where the costs applicable to these sales orders are accumulated.

In accordance with the customer's requirements as determined from the sales orders, production is scheduled through the various departments. The dispatching section moves the material into the packing and shipping area and prepares the work sheets describing the contents of each shipment. The traffic department makes the final packing sheets and an invoice master (which duplicates the information on the packing sheet) for each shipment. The invoice master and a copy of the packing sheet are forwarded to the accounts receivable department.

Recording Sales and Cost of Sales

A sales and cost of sales register is maintained for the purpose of recording each billing document by types of customer. The sales are recorded in the register by the accounts receivable staff. The cost department personnel posts the related cost of sales figures. Sales and cost of sales are classified by types of customers and are further classified in the accounts receivable department as follows:

1. Assemblies
2. Equipment and accessories
3. Spare parts
4. Experimental and development
5. Consignment
6. Display materials

The standard cost system applies to the sales and cost of sales recorded in the first three classifications. The packing sheets and invoices for these classifications are received in the cost department and valued at cost standards. These shipments, arranged by sales orders and then by part number, form the basis of the journal entry which transfers the material shipped at cost standard from the assembly work-in-process ledgers to the summary cost ledgers for sales orders.

The sales order work-in-process accounts are detail clearing

accounts used to accumulate costs by sales order number. The sales order accounts are closed to the cost of sales accounts at cost standards by journal entry. When spare parts, on which no direct labor has been performed in the shop, are shipped, a predetermined percentage of the cost standard is added to cover handling expenses. The charge for this percentage is to productive work-in-process overhead account with a corresponding credit to plant handling charges applied account.

Conclusion

It is said that necessity is the mother of invention. The standard cost system discussed here was developed as the result of a particular need. The historical cost systems which were used during the war years may have been acceptable in an economy where production was the paramount objective. Today such methods cannot hope to keep pace with the changing conditions of competition. It is not enough to record reams of data and make hundreds of detailed cost determinations. Management wants to know where it stands—today. It cannot wait until two weeks following the close of the current month to take action on problems which demand immediate attention.

This system was designed to provide operating management with a daily result of operations. The detailed cost determinations have taken a back seat and actual results by departments within the jurisdiction of supervisory groupings are compared to standards. Thus responsibilities for variations are readily analyzed and direct action is permitted.

Management must be provided with a plan or a predetermined basis of operation against which current results can be measured. It is only in this way that the financial future of an organization can be assured.

A STANDARD COST PROCEDURE WHICH FACILITATES HANDLING OF PRODUCTION ORDERS

by D. S. BRIGHAM, Works Accountant, and KENNETH CONNERS, Sr. Supervisor of Costs,

The Trumbull Electric Manufacturing Co.,
Norwood, Ohio

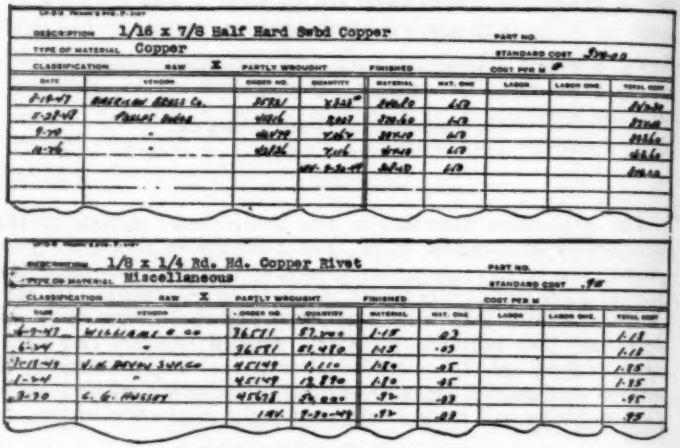
The application described in this article bears witness to the adaptability of standard costs. The company in which the procedures are in force processes numerous materials into more numerous parts and carries varied stocks of sub-assemblies. Its end-products include a large proportion of custom business. For the operations thus requiring reflection, detailed standard cost cards of three types are maintained which serve, not only to underlie the over-all cost entries, but also—through duplicating masters—provide operating and control information for production orders.

THE routines and methods used for the accumulation and use of information provided by a standard cost system vary among companies. It may be of interest, therefore, to outline the manner in which we operate our standard cost system, including its relationship to orders going into production and the methods we employ to currently record material and labor cost variances.

Our company manufactures a diversified line of electrical control apparatus. Well over half is manufactured to customers' specifications. Nevertheless, we have been able to carry standard costs through to practically all of the materials and operations used in the custom business. Our costs on this type of product are a combination. They include standard costs plus such special costs as are necessary to determine the total cost in any instance. Costs of all products made for stock, i.e., warehouse or packaged goods items—these constitute the balance of our business—are figured on a standard cost basis in their entirety.

The plan of this article is to describe the three types of cost cards in use—for raw materials and purchased parts, manufactured parts and assemblies—and to exemplify their use by following through the significance of the entries made on these cards in a (hypothetical) instance in which two raw materials and two manufactured parts go to make up a finished assembly. The exhibits accompanying the text serve both the first and the second

RAW MATERIAL COST CARD


DESCRIPTION 1/16 x 7/8 Half Hard Swbd Copper
TYPE OF MATERIAL Copper
CLASSIFICATION RAW X PARTLY WROUGHT FINISHED
STANDARD COST .57M.00
COST PER M
DATE VENDOR ORDER NO. QUANTITY MATERIAL MAT. ONE LABOR LABOR ONE TOTAL COST
2-19-47 American Brass Co. 28731 4,525 5.00.00 4.00
2-21-47 Phelps Dodge 49216 2,227 2.50.00 1.00 2.50.00
9-2-47 " 49279 7,467 8.37.00 6.00 8.43.00
12-26 " 49286 7,116 7.97.00 6.00 8.03.00
Adv. 2-20-47 .80.00 6.00 .86.00
1/8 x 1/4 Rd. Hd. Copper Rivet
TYPE OF MATERIAL Miscellaneous
PART NO.
STANDARD COST .98
CLASSIFICATION RAW X PARTLY WROUGHT FINISHED
COST PER M
DATE VENDOR ORDER NO. QUANTITY MATERIAL MAT. ONE LABOR LABOR ONE TOTAL COST
6-2-47 Williams & Co 36771 51,300 1.18 .03 1.18
6-3-47 " 36771 51,410 1.18 .03 1.18
7-18-47 U. S. Brass Mfg. Co 47199 1,210 1.18 .05 1.18
8-2-47 " 47199 13,890 1.18 .05 1.18
8-3-47 C. G. Hussey 47593 50,000 .91 .03 .91
Adv. 7-20-47 .91 .03 .91

(front and reverse of form are identical)

EXHIBIT 1

purposes, i.e., they illustrate the description of the cost cards as such and also the explanation then given of their use in connection with a particular product. Further, the later sections of the paper discuss the passage of up-to-date cost data from the cost cards, via a master, to individual production orders and set forth the basis of the labor standards in use and the time and manner of recording variances from standard costs.

The Standard Cost Cards

The Raw Material Cost Card (Exhibit 1) is a white card imprinted in black, on which is recorded costs of raw materials from vendors' invoices as they are received. The top or identification portion of the card will be observed to be the same as for the other cards and contains lines and spaces for inventory description of material, part number, type of material, standard cost, and classification. In this instance, the "raw" block would be checked. The remaining heading blank is for cost per thousand in terms of which all our standards are stated. The column headings of the body of the card, which are nine in number, will also be noted as not varying much from the column headings of the manufactured part and the assembly cost cards For the raw material card, these headings are: date, vendor, order number, quantity, material, ma-

MANUFACTURED PART COST CARD

DESCRIPTION Short Contact Finger PART NO. L-1103

TYPE OF MATERIAL Dorwood Convertifuse Parts STANDARD COST 26.64

CLASSIFICATION RAW PARTLY WROUGHT % FINISHED

DATE ENTERED	DATE CLOSED	ORDER NO.	QUANTITY	MATERIAL	MAT. OVHD	LABOR	LABOR OVHD	TOTAL COST
		1814	9-30-48	15.42		5.50	7.70	28.32
		1749	9-30-49	13.44		5.50	7.70	26.64

AMPERES VOLTAGE NO. POLES B. P. NO. L 1103

WHERE USED

RAW MATERIAL DESCRIPTION	SIZE	BAR LGTH	MDSE. CLASS	LENGTH OF PIECE	TOOL ALLOWANCE	NO. FINISHED PCS. TO ONE LENGTH	NO. OF LENGTHS PER 1000 PCS
COPPER	7/32 x 1/2	144"	0 V	2 1/2"	1/8 DIE SAW	60	16.7

DATE YEAR	DATE NO.	WEIGHT IN POUNDS FOR 1000 PIECES GROSS STOCK	SCRAPAGE	UNIT PRICE	GROSS COST MATERIAL PER 1000	MATERIAL O. H. E.	TOTAL COST MATERIAL WITH O. H. E.
1948	9	42		.36	15.12	-.-	15.12
1949	9	42		.32	13.44	-.-	13.44

(front of card)

L-1103 PC. WORK OPERATIONS

DESCRIPTION OF OPERATION	DEPT	% L. O. H. E.	TIME STUDY DATE	OPER. NO.	MACH. NO.	DIE NO.	SET UP	STD. HOURS 1000	RATE/HR.	PC. WORK PRICE 1000
Punch and pierce	14	146	Direct	1	98	447	-.-	.17	3.25	.63
Bend (Rivet and assemble)	"	"	"	2	44	441	-.-	1.6	3.25	5.20
Bend	"	"	"	3	94	449	-.-	1.9	3.25	6.18
Ream 2 sets 1/8" dia holes with "A" drill	"	"	"	4	-.-	-.-	-.-	2.9	3.25	9.42
										27.43

(reverse of card)

EXHIBIT 2

terial overhead, labor, labor overhead and total cost. In the other two types of cards, which also contain nine columns each, the date and vendor columns are replaced by date entered and date closed columns as related to the next column, order number, which obviously differs in significance on these cards, meaning production order rather than purchase order as on the raw material cards.

The presence of the labor columns on the raw material card may cause some question. They are there because we have some occasion to manufacture a part which we ordinarily buy. As will be noted from Exhibit 1, each purchase is entered on a separate line and a unit cost appears in the final column where it stands comparison with the standard cost shown in the heading data above.

The Manufactured Part Cost Card (Exhibits 2 and 3) is a white

MANUFACTURED PART COST CARD

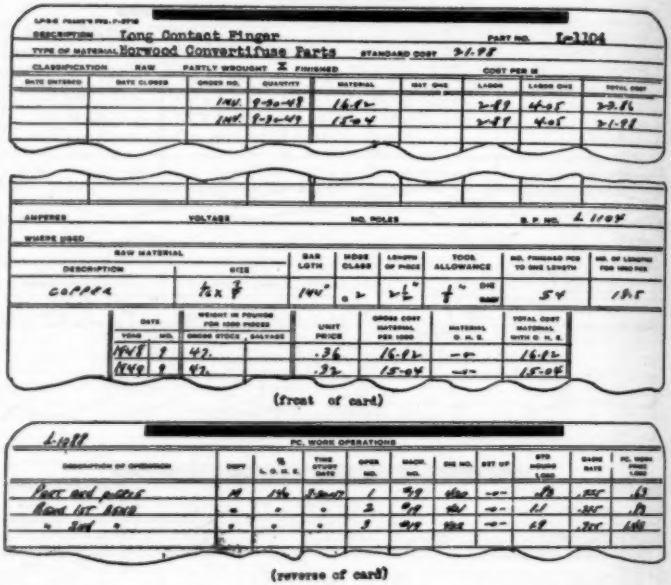


EXHIBIT 3

card imprinted in blue on which is recorded costs of a component part manufactured in our plant on factory production orders. As already commented the headings at the top of the card are the same as for the raw material card. The material classification checked is "partly wrought." Besides the column arrangement of the main portion of the card which resembles the other cards in the way which has been described, the manufactured part card has two special sections, one at the bottom and the other occupying the reverse of the card.

The bottom of the card is arranged to show the complete detailed cost of raw material required for the part. This includes such shop data as bar length, length of piece, tool allowance, and lengths for 1,000 pieces, as well as unit price of the material, gross cost per 1,000 pieces of the part, material overhead expense and total cost. We have provided space to record ten material cost changes which, in our case, would ordinarily cover ten years, as we customarily revise standard costs once a year prior to the costing of the annual physical inventory. The reverse of the manu-

ASSEMBLY PART COST CARD

DESCRIPTION Contact Assembly PART NO. Te1088

TYPE OF MATERIAL Norwood Convertitune Parts STANDARD COST 78.97

CLASSIFICATION RAW PARTLY WROUGHT X FINISHED COST PER M

DATE ENTERED	DATE CLOSED	ORDER NO.	QUANTITY	MATERIAL	MAT. ONLY	LABOR	LABOR ONLY	TOTAL COST
3-6-47	6-17-47	MP 3563	10,000	32.42		18.72	36.44	70.86
		194	10,000	32.55		17.90	36.32	78.87
10-14-47	12-10-47	MP 1351	10,000	32.55		17.26	36.42	78.97
2-12-48	3-15-48	MP 1418	10,000	32.55		17.26	33.10	78.81
3-5-48	4-22-48	MP 3573	10,000	32.55		17.61	32.54	78.61
4-15-48	5-20-48	MP 4236	20,000	32.55		17.31	32.83	78.85

PC. WORK OPERATIONS

DEPT	% L. O. H. E.	TIME STUDY DATE	OPER. NO.	MACH. NO.	DIE NO.	SET UP	STD. HOURS 1,000	BASIC RATE	PC. WORK PRICE 1,000
A1	140						7.23		5.07
A1	140						3.23		2.67
A1	140	9-24-48	1	#19	433	—	3.3	.755	7.82
"	"	"	2	#19	444	—	2.1	.755	2.19
B	"	"	3	—	—	—	1.23	.91	1.12

(front of card)

ASSEMBLED VOLTAGE NO. POLES B. P. NO. L1089

QUAN. REQ'D	PART NO.	NAME OF PART	MATERIAL	GROSS POUNDS	SALVAGE POUNDS	SCRAP VALUE	NET COST OF STOCK	O. H. E.	TOTAL COST OF STOCK WITH O. H. E.
1	L1103	Short Contact Finger	Copper	496	-0-	.3¢	12.4¢	-0-	12.4¢
1	L1104	Long " "	"	49	-0-	.3¢	1.5¢	-0-	1.5¢
4		7/32 x 7/8 Fib. Copper Rivet	"				1.8¢	.6¢	2.4¢

(reverse of card)

EXHIBIT 4

factured part card is set up to show piece work operations. As may be read from Exhibits 2 and 3, it is columnized to: description of operation, department, per cent of labor, overhead expense to labor, time study date, operation number, machine number, die number, setup, standard hours per thousand, basic piece rate, and piece work price per thousand.

The Assembly Part Cost Card (Exhibit 4) is a white card imprinted in red, on which is recorded costs of subassemblies or complete assemblies as manufactured on factory production orders. The headings at the top of the card are like those on the raw material and manufactured part card. The classification to be checked is, in some cases, "partly wrought" and, in some cases, "finished", the former if the part is a subassembly and the latter if the part is a complete assembly. Again the columnar arrangement of the face of the card has been covered in an earlier paragraph. As with the manufactured part card, there are two sections of the assembly part card devoted respectively, to materials and labor.

However, the labor or piece-work information (which appears on the reverse of the manufactured part card) is for convenience, placed at the bottom of the face of the assembly part card. It calls for the same operational data as with manufactured parts. The reverse of the card is thus reserved for the assembly components whether manufactured parts or raw material. As Exhibit 4 shows, the following information is called for: number of pieces, part number, name of part, material, gross pounds, salvage pounds, base used, net cost of stock, material overhead and total cost of stock with overhead expense.

Although we have provided on the cost cards (as will appear from the Exhibits) a column in the operations data to show the percent of departmental labor overhead, we do not provide a column to record the dollar amounts of the labor overhead. Our reason for omitting a labor overhead cost column is that we have many thousands of parts cards, covering materials manufactured on factory production orders, and any change in departmental labor overhead would require many more hours to revise our cost cards if we extended each item, as against merely showing the percentage of labor overhead. Under our method, when a change in departmental labor overhead is made, we merely change the percent in the column headed "% l.o.h.e." This elimination has not operated to limit in any way our ability to make cost comparisons during the year between actual costs and standard costs.

Part No. L—1088 Goes Into Production

Having set forth the contents of the several cost cards in our standard cost system, it is now practicable to illustrate the application of the standard cost routine by following this information through with respect to a typical assembly part manufactured and assembled in our plant. For each manufactured part or assembly, a duplicating master is prepared and is kept on file for use in issuing a production order to the factory. Each master contains the necessary current cost information appearing on the corresponding cost card and this information is duplicated from the prepared master on all required copies of the production order.

We must now reconsider our exhibits in reverse order. Our illustration centers about the cost card postings for Part L-1088, Contact Assembly, the subject of Exhibit 4. Into this assembly go one L-1104 Long Contact Finger, (Exhibit 3), one L-1103,

Short Contact Finger (Exhibit 2), and two 1/8" x 1/4" Copper Rivets (Exhibit 1). Into L-1103, Short Contact Finger, and L-1104, Long Contact Finger, go 1/16" x 7/8" half hard switchboard copper (Exhibit 1). The rivets and the copper are purchased material.

When this assembly part is required, a production order is issued to the factory which:

1. Initiates purchase of raw material.
2. Orders the manufacture of parts needed.
3. Orders the final assembly.

The postings on the bottom portion of the front of the manufactured part cost cards for the contact fingers show the amount of copper required and this information is transferred to the production order. The operations required and the related piece-work rates per thousand for these parts are taken to the production order from the data on the reverse of these cost cards. The material and labor data so taken will be noted as tying in as between the sample data on the body and the special sections of the manufactured part cards.

It should be noted that the cost cards for the contact fingers show that they are components of Part L-1088, the contact assembly. This is done by inserting the assembly number in ink. Thus, if there is a change in the piece-work rates or if labor operations are changed or added, we immediately make the changes on the individual part cost cards (Exhibits 2 and 3) and then transfer the effect of them to the assembly cost card (Exhibit 4). In this way we keep all our cost information up to date and consistent at all times. The masters used for the production orders are also changed at once. This method is followed through in respect of all piece-work or labor operation changes, thus eliminating the necessity of checking the rate of each labor operation at the time standard costs are revised. The cost figures for L-1103 and L-1104 are readily traceable between Exhibits 1 and 2 and the reverse of Exhibit 3, the front of which also refers to these components in terms of cost per 1000 pieces of L-1088. The assembly operations and rates appearing on the cost cards are also carried to the production order.

The device of cross-referencing components to the assembly in which they are used is extended to subassemblies as will be clear from the card for part L-1088 which we have so far considered as

an end product. However, it turns out to be merely a subassembly for incorporation in any of eight other assemblies, L-961 to L-968, as may be read from the ink notations above the operations column of the cost card. It is easier to make changes on all related cost cards as the changes occur, instead of going thru the entire cost file and checking each part when standard costs are revised.

Basis of Labor Standards

As in any primarily assembly operation (and in others, too), labor costs have outstanding importance. Our standard labor costs are embodied in piece-work rates.

We have four methods of establishing these rates as follows:

1. Time studies.
2. Comparable operations.
3. Combination of time studies and comparable operations (referred to as estimated piece-work rates.
4. Temporary rates where none exist, established for standard costs only (referred to as "red" rates).

The first three types of piece-work rates are used to pay the operators. The last-mentioned ("red") rate is never used to pay the operator. When we issue a factory production order we list all operations. Opposite each operation, we show the piece-work rate if it was established by one of the first three methods named above. Where we show "red" piece-work rates on our cost cards, we leave the rate blank on the production order. This is a signal for the time study department to supply a time study. When the time study is made, the "red" piece-work rate is changed to one of the first three types.

Current Determination of Variances

As variances are an important factor in the operation of any standard cost system, it is appropriate to explain here our routine in this respect. In recording labor and material variances, we try to take them up wherever possible, as they occur. For instance, on all vendors' invoices covering materials used in production, we charge the value of the material at standard to the inventory account and the difference between the standard cost and the amount of the vendor's invoice to a cost variance account. This was not our first routine and is an improvement over a former method which called for listing of cost variances of this nature

at the time of processing vendors' invoices and subsequent monthly totalling for book entry. The present method brings the material price variance into the records as a simple incident of bookkeeping. Our processing of labor time tickets will serve as another example. Each time ticket is distributed on the basis of standard cost for the operation to which it relates and the difference between the amount of the labor ticket and the cost standard is distributed to a cost variance account in the course of our monthly pay roll entries.

There are other items of variance that must be taken care of if inventory figures are to be kept at standard cost at all times. A typical example is scrap loss in excess of or under the scrap allowance included in standard costs. We calculate this variance monthly by the amount of our actual scrap sales to scrap dealers compared with our usage of material. All of the cost variances are booked as a profit or loss in the month in which they occur, with inventory accounts being debited or credited accordingly. As stated above, this has the effect of keeping inventory book figures at a standard cost valuation at all times.

A Change in Procedure

This brings us to a change, not previously mentioned, in the detail in which we make entries on the cost cards. The entries which are displayed on Exhibits 1 to 4, are typical of our initial procedure and have assisted in this description of our standard cost system. However, since we have developed our procedure for accounting and for booking of variances currently, we have made a change in the routine as outlined. It is no longer necessary to post the total cost of each production order to our cost cards. Such postings are called for by Exhibits 2, 3 and 4. In fact, we do not even calculate the total cost of completed production orders. There is no necessity for this calculation for the reason that we pick up, through regular accounting routine, the labor cost variances by operation. This omission of detail has saved much time. The cost cards now show one entry for each year, made at the time that standard costs are revised. The columns on Exhibits 2, 3 and 4 headed "Dated Closed", "Order Number", and "Quantity", have become obsolete. As for the material cost card shown as Exhibit 1, we do continue to enter it in detail. Material price variances are, however, determined as has been described.

At physical inventory time, after establishing the basic pricing

policy for costing of inventory, the costs which embody this policy become our new standard costs. These new standard costs so established are maintained as such throughout the year until the next inventory date. It will be noted that, in following this procedure it is important to determine the difference in valuation of the physical inventory between the inventory priced at old standards and the inventory priced at new standards. This difference represents a cost variance which is booked as a profit or loss, with a corresponding debit or credit to the book inventory figure. After this is done, the difference between the adjusted book figure and the physical inventory valuation represents the amount of overage or shortage disclosed on taking the physical inventory.

COMING ARTICLES

In the N. A. C. A. Bulletin—September, 1950

Accounting—A Mid-Century Appraisal
by John A. Beckett

Replacement of Long-Life Assets for Cost Reduction
by Sterling K. Atkinson

Is Your Head Office Necessary?
by John S. Rennolds

Applying Control to Marketing Costs
by E. W. Kelley

What Cost Reduction Means in Distribution
by Lawrence L. Ellis

Profit Analysis by Customers and Products
by William H. Yurkee

Cost and General Accounting in Telecasting
by C. E. Nicholson

Factory Service Variances In Standard Costs

In order to obtain maximum benefits from a standard cost system, factory service cost variances from standard charged to departments must be based on a flexible budget of standard allowances at graduated operating levels. This is more than familiar ground to many but as exemplified below it brings out the simple facts, which will be noted, of constancy of fixed costs at successive rates of operation and change in variable expense, which pose the problem of variance determination and analysis:

		Flexible Budget	
	Factory service cost rates	*Normal production level*	*90% of normal*
Fixed expenses	.20	$2,000	$2,000
Variable expenses	.30	3,000	2,700
Totals	.50	$5,000	$4,700
Units of product		5,000	4,500
Standard or allowed hours		10,000	9,000

Over-all Variance and Volume Variance Isolation

The figures in the factory service rate column are calculated by dividing the amounts in the "normal" column by 10,000, the number of standard hours. The data assumes that the product spends two hours per unit in this department.

If, in operations at 90% of capacity, i.e. processing of 4,500 units, actual time spent is 9,200 hours and actual factory service costs amounts to $4,850, we have the initial information with which to begin our explorations. The problem is to calculate the total variance and then to analyze this variance in as much detail as possible. Since 4,500 units were made, with a standard or allowed time of two hours each, the total standard or allowed time is 9,000 hours for actual production and, at the standard expense rate shown, 50 cents per hour or $4,500 is the amount charged to goods in process. Subtracting this amount from actual factory service cost of $4,850 gives the total adverse variance of $350. However, this is a figure with a fuse to it. It must be exploded.

A part of the variance was caused by the production of 4,500 units instead of 5,000. Since service cost detail in the illustration appears to assume that expenses are entirely fixed or directly variable with units produced, there could be no variance applicable to variable expenses if actual hours and allowed hours for actual production were the same. If they were the same, i.e., 9,000, actual hours, using the 30¢ variable rate, would equal $2,700, the allowed figure in the 90% column. Not so the fixed expenses if extended at the 20¢ rate. We get (by this calculation which presupposes a variability which does not exist) an "allowance" of $1,800, but by its inexorable nature, fixed expense remains at $2,000 and a volume variance of $200 comes to light. This is similar, as a concept, to loss due

to idle capacity and results from volume of products made. It should be noted that the measure of this portion of the total variance is the excess of service cost budgeted at actual volume (in this case $4,700) over the charge to costs at standard, an expense rate which is based on normal volume ($4,500). It is a debit or expense type of variance. It means that part of factory service facilities in existence and readiness to operate has not been charged to product.

Thus, out of the $350 variance in our initial example, we have characterized one portion amounting to $200 through a simple analytical procedure which has variable budgeting technique as its foundation. This volume variance is considered to be of less importance—at least to immediate supervision—than the remainder or controllable part of the variance. A department superintendent or a foreman would not ordinarily be responsible for lack of volume. However, the volume variance is of considerable significance to top management. The remainder or controllable part of the variance, amounting to $150, represents the difference between the actual factory service costs which has been stated as $4,850, and the amount allowed at the actual level of productions. The 90 per cent column shows this to be $4,700. It has a two-fold origin.

Controllable Variance: Efficiency and Spending Variances

One portion of the controllable variance was caused by spending more hours making 4,500 units than should have been spent. This is not the volume variance dealt with above which, assuming standard efficiency, explained the impact of fixed costs on lower than normal volume. The variance now being considered relates standard and actual hours for the production actually achieved. A total of 9,200 actual hours were spent in producing 4,500 units, as against 9,000 standard hours for this production. This may be designated as:

Premium cost of 200 hours (200 x variable rate of 30¢) = $60

We have now introduced into our analysis the volume variance in factory service costs and, of the controllable remainder, the portion known as efficiency variance. Not accounted for is $90, which will be found to represent expenditure variance, the amount by which the actual factory expense outlay of $4,850 exceeded standard for the 9,200 hours of direct labor time spent. This variance is the result of using an excessive amount of supplies or other factory service in relation to the *time* the plant operated (not the amount of product made, which has been considered for the efficiency variance) or of purchasing factory service items at prices above standard.

Introducing A Semi-Variable

Perhaps we have been making things too easy for ourselves by ignoring semi-variable expenses. The following figures, repeating those of our earlier example, split semi-variable expenses from the variable category and add a $25 amount thereto in the 90 per cent column to reflect the fixed element and the elimination of strictly proportionate change:

		Allowances based on flexible budget	
	Factory service cost rates	*Normal production level*	*90% of normal*
Fixed expenses	.20	$2,000	$2,000
Variable expenses	.20	2,000	1,800
Semivariable expenses	.10	1,000	925
Totals		$5,000	$4,725
Units of product		5,000	4,500
Standard or allowed hours		10,000	9,000

Total variance		
Actual factory service costs	$4,850	
Factory service costs charged into production	4,500	
Total factory service cost variance		$350
Volume variance		
Factory service cost budgeted for 4,500 units	$4,725	
Factory service cost charged into production	4,500	
Volume variance		$225

In this instance, volume variance is logically the 1,000 hours times 20 cents (the $200 which represents service cost not utilized for lack of this production at the 90 per cent level). Now, however, there is another segment of fixed cost. We must consider the amount of the semivariable which is fixed (or which does not vary directly in proportion to production). A fixed amount of $25 is implied in the $925 budgeted in the 90 per cent column, which exceeds proportionate reduction from 1,000 by that amount. It is an addition to volume variance, an additional unused but incurred cost under the concept which has been mentioned, and results in a total volume variance of $225. This amount is caused entirely by failure to operate at normal production.

However, our over-all variance of $350 is no different in the restated example than in the original one. We have simply considered that an additional $25 of expense was fixed and not variable. As to the controllable variances, these are naturally less by an aggregate of $25, because, on the same total expense of $4,850, they are measured in turn with the 90 per cent of normal budget figure as a starting point, and this has increased by $25. The efficiency variance may perhaps be $50 and the expenditure variance $75. Only detailed analysis will show, as illustrated below.

Reporting to the Foreman

So far we have talked only in terms of kinds of variances and have designated our subject matter simply as factory service costs. A more practical use of variances can be illustrated by the use of factory expense account classifications. The following data, based on the figures which have been

revised to acknowledge the existence of semivariables, furnishes more detail about the individual costs:

	Allowances based on flexible budget			
	Normal production level	*90% of normal*	*92% of normal*	*Actual*
Rent (fixed)	$1,500	$1,500	$1,500	$1,500
Taxes (fixed)	500	500	500	500
Indirect labor (variable)	1,400	1,260	1,290	1,340
Repairs (variable)	600	540	550	570
Supervisory labor (semivariable)	800	740	740	750
Supplies (semivariable)	200	185	195	190
Totals	$5,000	$4,725	$4,775	$4,850

Since a department superintendent or a foreman is responsible only for the controllable type of expense, a report to him would not necessarily include the expenses related to volume. A report for this level supervision might include only the variable and semivariable expenses, as follows:

REPORT TO FOREMAN

(Actual production 4,500 units or 90% of normal. Actual time 9,200 hours. Allowed time 9,000 hours)

	Actual	*Budget at 92%*	*Budget at 90%*	*Total controllable variance*	**Time*	***Use*
	(1)	(2)	(3)	(1-3)	(2-3)	(1-2)
Indirect labor	$1,340	$1,290	$1,260	$ 80	$30	$50
Repairs	570	550	540	30	10	20
Supervisory	750	740	740	10	—	10
Supplies	190	195	185	5	10	(5)
Totals	$2,850	$2,775	$2,725	$125	$50	$75

*Time—Variance due to inefficient use of time.

**Use —Variance due to waste or excessive price of factory service items.

From this type of report, the foreman can see that the total excess expense in his department amounts to $125, the controllable amount dealt with earlier less the $25 transferred to volume variance in the revised figures, and can see what items of expense caused it.

It should be emphasized that the *total* of the variance due to inefficient use of time is of much more importance than the detail in the column, because this variance cannot be controlled by studying the variances of the separate accounts. It is caused entirely by inefficient use of time—probably entirely that of the direct labor group. However, the variance caused by waste or increased price can be controlled only by analysis of the detailed items making it up.

Contributed by VINTON S. CURRY, *Denver Chapter*

AN APPLICATION OF A BASIC STANDARD RATE TO DIRECT LABOR

by JAMES F. MERRICK,
Supervisor of Costs, Monroe Calculating Machine Co.,
Orange, N. J.

Facing apparent necessity for annual revision of standard labor rates, previously set on a long-range normal cost related to weighted averages of job or occupational rates for each cost center, the company on which the present article is based turned instead to the use of a basic standard labor rate. A dollar an hour was selected for all operations throughout the plant. Not least among the advantages of the present system, as recited by the author, has been the apparently incidental one of numerical identity of standard labor costs and hours.

THE purpose of this article is to describe an improved application of standard costs for direct labor distribution. The objectives of the improvement were to render the information more serviceable and to avoid the expense of revision of the system, perhaps frequently, to reflect rapidly rising labor costs. Prior to the changes to be described, labor cost standards had been set on the basis of what were conceived to be normal rates and were reviewed periodically but revised only for major changes in the bases. In practice, the procedure followed meant that a standard rate was set for each department or cost center, on weighted averages of the job occupational rates for the work performed in these locations. The results of this averaging process is to some extent to reflect long-range normal costs. The whole endeavor was centered around a concept of expected normal but the data available tended to give current actual rates the greatest influence on the figures used. Labor wage and efficiency variances were controlled through a system of variance accounting and allocated to cost of sales through unabsorbed burden distribution.

Of the deficiencies of the standard cost system before revision, as applied to labor costs in times like these, perhaps the major shortcoming was that the resultant inventory figures as they appeared in the financial accounts were understated by the extent of the incurred labor variances, so far as these variances were created by

MATERIAL	LABOR	1.40			
.12	DATE	4/50			

PER C

NAME Arm for engaging yoke and yoke trip PART NO. 57090

MATERIALS	L-X	LA-5	LA-6	LE-1307	M	MA-7-W-3	C8	C8A	C8T	CAA				BK
.040-.042 X 1¼ hard CRS 16.9# per M 1 3/32" spac. @ $7.00 per C lbs.					1	1								8
					1	1								10

NO.	OPERATION	DEPT.	TOOLS USED	STD.	COST	STD.	COST	STD.	COST
1	Blank and Pierce	2	B & P die 4709	2720	.04				
2	Roll Finish	4		4000	.03				
3	Pierce	2	N 57090 for gen P die	850	.12				
4	Form 2nd Lug	2	Gen spring tab form die	600	.17				
5	Clip	2	Nest c-13 clip die	850	.12				
6	Inspect	13B							
7	Mill	5		)					
8	Burr	5		) 128	.78				
9	C/S	5		850	.12				
10	Harden	6		5000	.02				
11	Inspect	13H							
12	Stock								

508-H 2-50

MASTER ROUTE AND STANDARD COST CARD

EXHIBIT 1

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changing conditions. With upward changes in labor rates a common occurrence, more frequent revisions of standard costs came to appear necessary. However, complete revision of individual cost cards (involving changing standard labor rates, material costs, and subsequently building up assembly and machine costs) presented a prospective task which bid fair to require approximately four thousand clerical hours. If this were to be done annually, it would represent a large special outlay for the necessary clerical overtime as a result of having to meet a required deadline for completion.

Instead of meeting the problem in this way, a changeover to a completely basic standard cost for labor rate costing was introduced. The plan is predicated on the use of one base labor rate for all cost centers. This established base remains in effect indefinitely. The in process inventory accounts are adjusted on a percentage basis, (the percentage varying from time to time) to give current costs for statement purposes.

Identical Digits for Standard Hours and Standard Labor Cost

A basic standard labor rate of a dollar an hour is used for all labor costing. This means that all cost cards in the file are computed on that basis, i.e., the time standard divided into this constant standard rate results in standard labor cost to manufacture. Through the use of this rate or cost factor of one, it follows that the digits representing standard cost in dollars and cents, also represents standard manufacturing times in hours and decimals thereof. The basic standard labor cost of a part, assembly or finished product may be converted to standard hours by simply dropping the dollar sign. For instance, if the basic standard labor cost to produce a certain model is $50, it is known at once that the product requires 50 standard hours in its production. The advantages of this flexibility are more important than might be supposed and will be covered as this paper progresses.

The Master Route and Standard Cost Card in use is shown as Exhibit 1. So far as labor is concerned, the space provided at the top of the card allows for astandard cost per hundred pieces (which will also be standard hours per hundred pieces), together with the date of this standard, and boxes for three revisions and dates. These revisions will, of course, reflect changes in time standards only, or in operations performed. Making even these changes on the cost card is something of a task and, to render

CONVERSION CHART

Standard Pieces Per Hour to Standard Hours (or dollars) Per Hundred Pieces

Time Standard Ranges in pieces per hour	*Standard cost (or hours) Per hundred pieces*
513-540	.19
541-571	.18
572-606	.17
607-645	.16
646-689	.15
690-740	.14
741-800	.13
801-869	.12
870-952	.11
953-1052	.10
1053-1176	.09
1177-1333	.08
1334-1538	.07
1539-1818	.06
1819-2222	.05

EXHIBIT 2

it less time-consuming when it becomes necessary (and also to render the results less subject to error), we provide the cost clerks with charts like that exemplified by Exhibit 2. These contain two columns, one for the engineered time standard ranges in terms of pieces per hour and one for the corresponding decimal for standard hours—identical with standard cost—per hundred pieces.

Ready Adjustment to Current Labor Costs for Inventories

In order to make sure that the inventory at basic standard labor cost might be susceptible of adjustment on a percentage basis to approximate current cost levels for financial statement purposes, it was necessary to make a study of labor variance factors. Current and past performance analyses of the industry revealed that the mix of labor by cost center is highly consistent and—because it does not appear to change markedly with varying mixes of production output in such departments as screw machine, punch press, milling, hardening, plating, subassembly and final assembly —it seemed clear that the labor element of cost was highly adaptable to the development of a percentage factor for adjustment from the basic standard to current actual cost. The following explanation will serve to set forth a means of arriving at a weighted average wage adjustment percentage on the overall operation or, if desired, departmentally.

The current weighted average base labor rates by cost centers

DEVELOPMENT OF DEPARTMENTAL AND OVER-ALL PERCENTAGES TO ADJUST DIRECT LABOR AT THE BASIC STANDARD RATE TO APPROXIMATE ACTUAL RATES

Department	*Weighted average base rate*	*Hour requirements based on production schedules*	*Extended value at actual*	*Adjustment percentage by department*
1	$1.60	4,050	$ 6,480	60%
2	1.20	8,000	9,600	20
3	1.10	1,500	1,650	10
4	1.35	5,000	6,750	35
12 (Final Assembly)	1.05	10,000	10,500	5
12 (Final Inspection)	1.40	6,200	8,680	40
13 (Parts Inspection)	1.15	2,226	2,560	15
		36,976	$46,220	——

Computation of over-all adjustment percentage:

$$\frac{\$46,220.}{\$36,976.} = 25\% \text{ over basic standard}$$

EXHIBIT 3

were obtained by adding the base rates of the direct operators and dividing the result by the number of operators. In performing this operation, the job occupational ranges were closely scrutinized and learners and others in temporary categories with special rates, were omitted. This was done because of the knowledge that these operators would, within a definite period of time, be assigned regular codes within the prescribed ranges governing the type of work under consideration.

It is possible, as Exhibit 3 will make clear, to read the *departmental* adjustment percentages directly from these rates, inasmuch as the standard basic labor rate is the digit "one". However, the effect of these rates on department production costs must be summarized, as also shown in Exhibit 3, to arrive at the over-all adjustment rate. The production time requirements of each of the cost centers were developed on current and anticipated production schedules broken down by department and verified to both past and current performance records of the departments on an actual hour basis. With approximate actual pay and production rates thus established, it became possible to develop a percentage comparison with standard which could be used to convert the labor content of inventories at standard cost to actual and could also be used in other analyses where it was desired to know

DIRECT LABOR CONTROL
(productive hours)

Month of .....

Department	*Product Divisions*			
	A	*B*	*C*	*TOTAL*
1	3,000	1,100	—	4,100
2	5,160	2,600	60	7,820
3	950	500	—	1,450
4	3,175	1,875	75	5,125
Piece parts Total	12,285	6,075	135	18,495
12 (Final assembly)	7,050	3,075	25	10,150
12 (Final Inspection)	4,000	2,295	15	6,310
13 (Parts Inspection)	1,490	769	4	2,263

EXHIBIT 4

quickly the rough relationship between standard and actual labor costs for a segment of operations or for the operation as a whole.

The percentages set up as described to adjust inventory quickly from basic standard labor rates to current labor costs, are the subject of continuing study so that the conditions of new labor contracts or other major disturbances in the wage scale may be reflected in inventory valuations in timely fashion. Thus, we are continuously cognizant of the divergence between standard labor at basic costs and actual rates and of alterations in this relationship.

Accounting for Direct Labor

Inventory controls and direct labor accounting are handled in practically the same way under the basic standard labor rate plan of costing as they were before. Direct labor hours from the various cost centers are accumulated on a direct labor control monthly. This report summarizes standard direct labor hours earned by departments and classifications and becomes the media for subsequent accounting. These hours now represent standard direct labor dollar figure also through the use of the dollar an hour basic rate. The arrangement and hypothetical figures used in Exhibit 4 represent substantially the type of form used. The subtotal representing earned hours on piece parts becomes the basis for the determination of standard parts inspection cost which is applied on a percentage basis.

From the summary thus provided, standard basic direct labor cost may be charged to work in process by affixing a dollar sign to

SCHEME OF IN PROCESS AND VARIANCE LEDGER ACCOUNTS

Asset accounts

100 Work in process (Control account in general ledger)
—1 Product division "A" (Subsidiary ledger account)
—2 " " "B" (" " " ")
—3 " " "C" (" " " ")
—1 Direct labor (basic)
—2 Direct material (standard)
—3 Burden (applied as a percentage of direct labor)
—4 Revaluation (Application of wage adjustment to actual rates)

Example: 100-1-1 Product "A" direct labor
100-3-4 Product "C" revaluation

Variance accounts

500 Direct variances
—1 Gain or loss on final inspection
—2 Gain or loss on parts inspection
—3 Wage fluctuation
—4 Labor shrinkage

Factory burden accounts

501 Direct labor (undistributed)
The figure appearing in this account is cleared out to a zero balance monthly.

EXHIBIT 5

standard direct labor hours shown thereon. As a whole, the work in process account in the general ledger is supported by subaccounts in the subsidiary ledger maintained in the cost department. These subaccounts break the process account down into standard labor, burden, and material. We have now introduced a fourth element, which is the revaluation to adjust standard labor from basic to actual rates. In this way, basic standard labor cost will always be segregated from the element of the necessary adjustment to actual rates. Hence, in all future periods a consistent means of comparing standard labor costs or hours with other periods is available and adjustments which would be necessary if there had been changes in departmental rates in the comparative periods do not have to be considered.

Exhibit 5 lists the accounts involved in charging costs to work

FINAL INSPECTION

Month of .....

Product	*Number of units produced*	*Standard hours per unit*	*Standard hours earned*
"A"	1,010	4.00	4,040.
"B"	600	3.75	2,250.
"C"	3	5.00	15.
Totals	1,613		6,305

EXHIBIT 6

JOURNAL ENTRY
TO ADJUST DIRECT LABOR

Balance in 501 Account $46,550.00

Item	Description	Debits: Product "A" a/c 100—1	Debits: Product "B" a/c 100—2	Debits: Product "C" a/c 100—3		Variances a/c 500	Credits a/c 501
1.	Gross basic standard direct labor (Excluding parts inspection)	$12,285.00	$6,075.00	$135.00			$18,495.00
2.	Gross standard final assembly labor	7,050.00	3,075.00	25.00			10,150.00
3.	Gross standard final inspection labor	4,000.00	2,295.00	15.00			6,310,00
4.	Variance on final inspection (Exhibit 6)	40.00	(—45.00)		—1	$5.00	
5.	Gross standard direct labor, parts inspection	1,490.00	769.00	4.00			2,263.00
6.	Standard parts inspection (12% of line 1)	1,474.00	729.00	16.00			
7.	Variance on parts inspection (Lines 5-6)				—2	44.00	
8.	Total basic direct labor before shrinkage (Lines 1, 2, 3, 4, and 6)	24,849.00	12,129.00	191.00			
9.	Adjust 501 account for aggregate labor variance				—3	9,332.00	9,332.00
10.	Labor shrinkage in piece parts (1% of line 1)	(—123.00)	(—61.00)	(—1.00)	—4	185.00	
		—1 —1	—1				
11.	Net basic standard direct labor (Lines 8-10)	24,726.00	12,068.00	190.00			46,550.00
12.	Subtotal of control accounts		36,984.00			9,566.00	
13.	Adjust basic standard direct labor to actual (25% of line 11)	6,182.00	3,017.00	47.00	—3	(—9,246.00)	46,550.00
14.	Revised totals—Control accounts		46,230.00			320.00	

(Figures appearing on lines 11, 13 and 14, and figures for the variance subaccounts under the 500 column posted to ledger)

EXHIBIT 7

in process. Payroll distribution procedure in initiated by charging all departmental expense, both direct and indirect to the appropriate accounts. The balance represents that portion of the total payroll which is allocable to direct production labor. This figure is temporarily charged into burden as the undistributed and unadjusted potential value of direct labor. Subsequently, through the monthly direct labor journal entry, this amount is eliminated from account 501 and properly charged to the various product line process or pertinent variance accounts.

The cost of parts inspection, which is carried out on a sampling basis, is distributed to inventory costs of product lines on an established percentage basis. Any difference between this figure and the actual amount of inspection time turned in results, in either a debit or credit to the appropriate variance account. Final inspection standards are established by the rate engineering department on a time study basis and are used in determining gain or loss as a result of this operation. As this type of work is not included on an incentive basis for payment purposes, a form (Exhibit 6) is prepared monthly which lists the number of units produced extended by the established standard of performance. This figure, compared to the actual hours, results in the determination of the gain or loss chargeable to the proper variance account.

As a recapitulation of the procedure which has been described, reference may be had to Exhibit 7 which displays the monthly journal voucher covering direct labor. In the main, the sequence of information given readily explains itself. The substantial figure in line 9 of the variance column is the amount of actual payroll which the standard labor cost at the basic rates will not absorb. The portion of this representing the difference between the basic and the current rates, computed at the 25 per cent figure worked up in Exhibit 3, is restored to inventory at line 13 of the same column, leaving the total of the column to represent net variance from other causes.

Aid in Determining Changing Production Requirements

There are many advantages in having identical expression of standard cost and standard hours. It provides opportunity for quick computation in the building up of labor costs for comparison with outside prices and many other phases of cost work which arise frequently. One of its most important functions is to assist in accurate analyses of hour requirements by the various

MONTHLY LABOR FLUCTUATION ANALYSIS (Per hundred units)
All changes represent both standard dollars and hours

Part number	*Change*	*Reason for change*	*Model usage* A	B	C	*DEPARTMENTS* 1	2	3	4	12 A	12 I
123	(— .58)	A	1				(—.08)	(—.43)	(—.07)		
345	(— .62)	B	1				(—.50)	(—.04)	(—.08)		
567	.18	C	1						.18		
890	(—1.36)	A	1			(—1.09)	(—.10)	(—.15)	(—.02)		
126	(— .48)	B	1				(—.05)	(—.07)	(—.36)		
Totals	(—2.86)					(—1.09)	(—.73)	(—.69)	(—.35)		

Explanation for Codes A, B, C, etc.

EXHIBIT 8

MODEL ANALYSIS (Per hundred units)
(Standard Hours Required by Department)

MODEL "A"

Date etc.	*Total*	1	2	3	4	12 A	12 I
Model A, hours 3/31/50	1,381.51	245.06	327.76	27.57	673.91	36.76	70.45
Fluctuation, April, 1950	(—2.86)	(—1.09)	(— .73)	(— .69)	(— .35)		
Revised requirements 4/30/50	1,378.65	243.97	327.03	26.88	673.56	36.76	70.45

EXHIBIT 9

types of models. In this connection the standard hour requirements by department are analyzed and subsequently become the media for determination of man hour and machine hour schedules for production purposes. An analysis of this sort is still a difficult operation to perform and one that would normally be done only when need arises. With constantly changing time standards and added or eliminated operations as a result of engineering studies, it becomes probable that some degree of error will be developed and integrated into the production schedules. This liklihood is reduced by the use of identical standard time and rate figures.

In conjunction with the overall revision of standard cost accounting for labor resulting from the introduction of the basic rate, a machine use fluctuation survey has been developed and a current study of the increasing or decreasing trends in utilization by departmental hours is to be maintained. This will result in latest figures being available at all times. With any change in production schedules, the man hour and or machine hour loads can be revised with a minimum of trouble. In order to make this possible, it was necessary to analyze each of the current major product models by department hours required in its manufacture. This was accomplished by making a list of every part and assembly included in the model and subsequently distributing the standard hours by department from the cost cards. The results of this survey became the starting point to which the current changes in the parts are applied to particular models. At the end of each month, a revised hourly breakdown of the model hours by department is available for making the necessary revisions in production scheduling or forecasting which may become necessary. The monthly labor fluctuation in terms of production per hundred units is compiled on regular forms which provide columns for the part number, change, reason for change and usage by model. (Exhibit 8). The net change by department is determined monthly and posted to the control sheet of the model. This creates a trend analysis and method of control illustrated by Exhibit 9.

A Practical and Useful Device

As indicated at the start of this article, perhaps the primary factor motivating the change from weighted average standard labor rates by cost centers to a basic rate of a dollar an hour was the current trend in labor rates in the various cost centers. Both

the upward movement which made it hard to keep standards up-to-date and the effect of minmium wage laws and collective bargaining in levelling off occupational differentials of the wages in an industry made the basic standard rate practicable and desirable. Higher prices and wages, and the frequency with which they change, have always necessitated revisions in the standards upon which inventory valuations and subsequent accounting can be based. With the procedure for continuing revision, on the foundation of the basic standard rate, such pricing can be readily raised or lowered to current levels through a percentage application to standard basic costs, and the effect can be created both rapidly and economically.

In addition to the foregoing, flexibility has been achieved which is serviceable in making comparisons and other statistical computations readily available for management consideration, without the necessity of incurring a large expense for clerical labor which would ordinarily arise with complete revisions of costs.

TEST RUNS SUPPLY BASIS FOR STANDARD COSTS IN A BAKERY OPERATION

by LAWRENCE C. ERNE,
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Proposals for installation of standard costs may sometimes fail at the point at which it has to be decided whether or not reliable standards can be set without too much ado, cost-wise or procedure-wise. For this reason, the test run idea has real appeal. Its serviceability for establishing suitable standards for baking and packing costs, together with the forms used by the author's company, is set forth in the present article.

IN the biscuit industry, there are three basic processes: a mixing operation, a baking operation, and a packaging operation. It might seem that a detailed time study technique must be employed to establish the standards so that these operations may be brought under proper control. However, this is not necessary. We have found that satisfactory standards can be determined by the use of *test run procedure.*

The principle of the test run is to provide a significant portion of the data for synthetic standards based also on combination of past performance and machine capacity. Upon scheduling a new item to be produced, the production superintendent determines the formula requirements as a first step. In other words the raw material specifications are pre-planned on a formula basis. Once established, no change in material requirements is to be made without authorization. The type and character of the product determines the type of die required and the machine on which it is to be made. Several types of cutters or dies are used for the several types of product and all of them are adaptable to the same baking operation. However, the baking method does differ with the materials used.

It is necessary for the baking floor supervisor to determine the best rate of speed, baking time, and baking temperature required to produce the cookie. The number of direct labor operators is determined by the machine assignment. Many machines accommodate a number of types of dies and can produce a variety of products with the same labor complement. Since the baking oper-

TEST RUN CARD

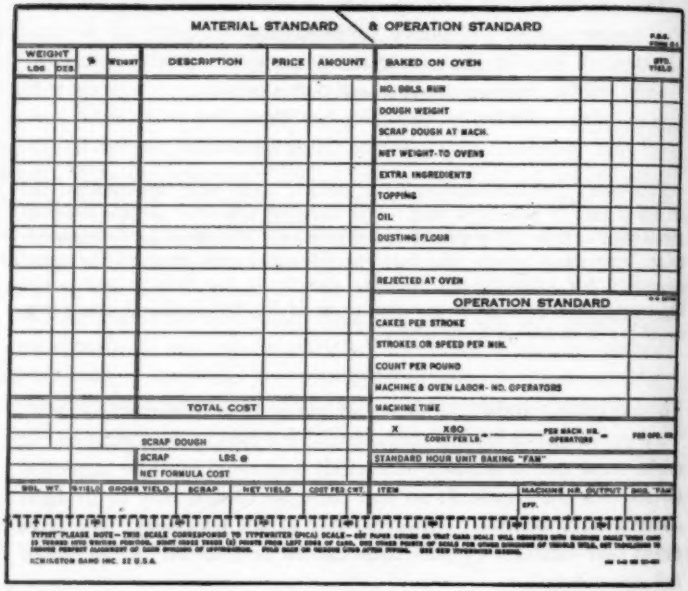


EXHIBIT 1

ation is central to the entire manufacturing cycle, it can be understood readily that the most important of the test run procedures covers this phase of processing operations.

The Test Run Card Recaps Standards

The test run procedure is best illustrated through the test run card shown as Exhibit 1 which embodies a coordinated record of information worked out to establish both material standards and baking operation standards. The card is divided into two parts. The left portion contains material specifications. The right portion contains operation data and specifications. All the information is coordinated to establish two basic standards. The first provides a standard material yield and the second establishes standard labor and machine productivity.

A per cent-of-yield factor is applied to each material item to obtain a total standard yield expressed as a physical unit for the entire formula "batch." The operation data reflect a scheduled

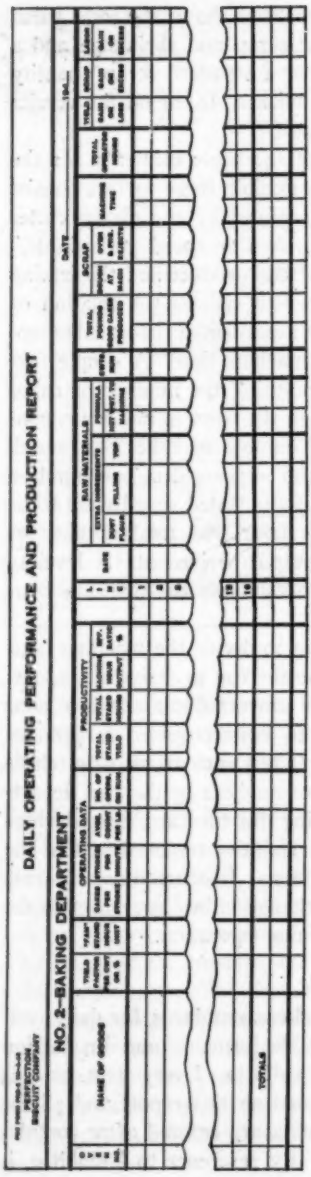
run under normal operating conditions and shows the total batch weight, with a process allowance for scrap and shrinkage and a net weight to the ovens. At this point a standard scrap quantity at the oven and packing table is established, based on the results of the test run on which the data are built.

The operation standards consist of the basic elements for the machining process. As shown on the exhibit, these factors consist of "cakes per stroke," which is determined by the die or cutter used for that particular product, "strokes or speed per minute," which is determined by the nature of the product and the baking time required, "count per pound," which reflects the relation of the product as to size and weight, the number of direct labor operators assigned to the process, and machine time. A simple formula establishes the standard by computing the number of cakes produced on the machine and baked in the oven in one hour, converted to pounds by dividing by the number of cakes per pound. This result is the machine hour output expressed at one hundred per cent efficiency. In other words, if the stated speed were to be maintained for sixty minutes every hour, the total number of pounds produced should equal the output arrived at. A leveling allowance is made at 89 per cent to establish the machine hour output at an actual operating level.

The last step in the computation is to divide the machine hour output by the number of operators on the run to arrive at the output per operator hour. This in turn is converted to a standard hour unit which represents the part of an hour required to produce 100 pounds of finished product. Three test runs are usually scheduled by the production department for analysis by the cost department to establish the standard. During this time any irregularities should be corrected and process uncertainties removed so that the operation can be set up on a normal basis. Instructions are issued, requiring an authorization for any change either in respect to the formula specifications or the machining operation.

Daily and Monthly Reports of Results

It is comparatively simple to use these standards for daily control by means of a Daily Operating Performance and Production Report. This report is shown as Exhibit 2. Every item, as it is scheduled for production, is pre-posted on this report and all the essential operating and production data are entered after completion of all operations for that day. By reference to Exhibit 2, it



DAILY OPERATING PERFORMANCE AND PRODUCTION REPORT

NO. 2–BAKING DEPARTMENT

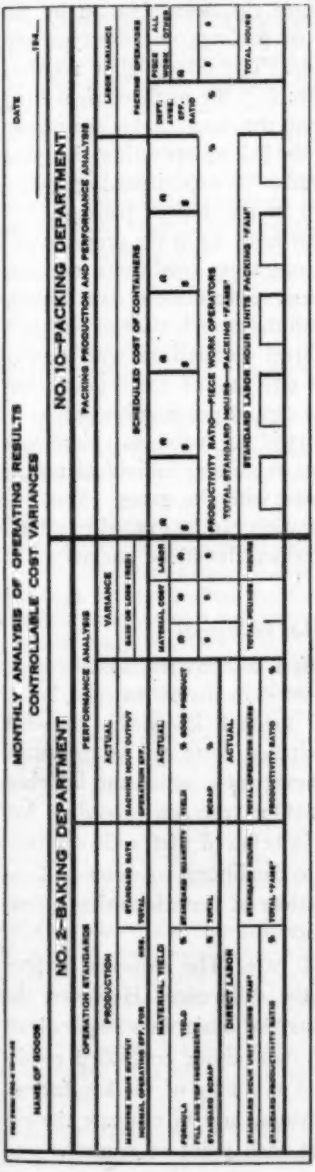
DATE

EXHIBIT 2

can be seen that the application of the "yield factor" and the "standard hour unit" (developed from the test runs) provides a daily productivity analysis.

This explanation has followed through the steps required in the establishment of standards based on *test run procedure* and the resulting use of these standards for a daily control report which is submitted to the production foreman by noon of the next day. Since the standards originated under actual operating conditions, the results may effectively be used on the production line by means of graphic charts that the men on the job will recognize as fair. The supervisor feels a direct responsibility for the results and can concentrate his efforts on maintaining a uniformity of his product by operating the machines according to the established plan and with a minimum of loss, either of material, manpower, or machine utilization.

Management is provided with a monthly control report which isolates the factors of controllable variances and highlights those where corrective action is needed. All scheduled runs of each product during the month are posted to a monthly produc-



MONTHLY ANALYSIS OF OPERATING RESULTS
CONTROLLABLE COST VARIANCES

NAME OF GOODS — DATE ____ 194__

NO. 2–BAKING DEPARTMENT — NO. 10–PACKING DEPARTMENT

OPERATION STANDARDS — PERFORMANCE ANALYSIS — PACKING PRODUCTION AND PERFORMANCE ANALYSIS

PRODUCTION — STANDARD RATE: HRS., TOTAL — ACTUAL: BAKING HOUR OUTPUT, NORMAL OPERATING EFF. FOR ____ HRS., OPERATION EFF. — VARIANCE: BAD OR LESS (RED)

MATERIAL YIELD — ACTUAL

FORMULA: YIELD % — STANDARD QUANTITY
FILL AND TOP INGREDIENTS: % — TOTAL
STANDARD SCRAP: SCRAP %

DIRECT LABOR — ACTUAL

STANDARD HOUR UNIT BAKING "PAN": STANDARD HOURS — TOTAL OPERATING HOURS
STANDARD PRODUCTIVITY RATIO %: TOTAL "PANS" — PRODUCTIVITY RATIO %

SCHEDULED COST OF CONTAINERS: @ ____ @ ____ @ ____

PRODUCTIVITY RATIO—PIECE WORK OPERATORS: %
TOTAL STANDARD HOURS—PACKING "PANS": %

STANDARD LABOR HOUR UNITS PACKING "PAN": TOTAL HOURS

LABOR VARIANCE

	MATERIAL COST	LABOR	HOURS
	@	@	
BAD OR LESS (RED)	@	@	
	%	%	

PACKING OPERATORS

	PIECE WORK	ALL OTHERS
DEPT. LABOR EFF. RATIO	@	
	%	%

EXHIBIT 3

tion ledger and the daily results are summarized on a Monthly Analysis of Operating Results, Exhibit 3. This report provides a monthly analysis of controllable cost variances. From the information listed, a direct comparison of the operation standards as established by the test run procedure can be made against the actual performance as reported daily and summarized for the month and is analyzed to the three major elements of cost: (1) operation of facilities; (2) material yield and scrap, (3) and direct labor.

Special Problems of the Packaging Operation

Establishment of operation standards for the packaging department follows the pattern set by the baking department. However, in this process group a greater flexibility is required. For example, a saltine cracker which can be mixed, machined and baked under constant operating conditions will vary greatly in the type of packaging material and direct labor required in order to produce a variety of packages ranging from boxes of seven pounds each to small cartons of seven ounces each —and even to individual bags containing only four crackers.

The test run information will include the determination by the department supervisor of the style of package and the type and quantity packaging material required. The direct labor requirements are affected by two conditions: (1) the method of packing and (2) the quantity of product from the oven. Since the output of the oven has been determined by the baking operation, the labor problem in packing concerns the number of experienced operators it will take to pack the oven output in the desired package.

Current experience data and "know-how" as to the proper packing method, obtained under actual operating conditions, are embodied in the results of the test runs. Specification data include the type of cookie, size and number to the pound, style of package, and the method of packing. By direct comparison with similar products, the effect of variation at any one of these points can be measured in terms of direct labor output per operator hour.

The packaging operation lends itself to individual piecework incentive and a daily report is made recording individual results and coordinating these output figures with the group effort. In this way the piecework packing operation can be graded to a high level of efficiency and any new product should be packed at an equally high level of productivity.

Test Run Standards Adaptable to Other Industries

As stated earlier, the purpose of a cost control system is to establish effective control over the cost elements of material, labor, and machine utilization, preferably through knowledge of what costs should be. In this way, anticipated costs can be measured with actual results so that proper management action can be taken to correct out-of-line performance. Our test run procedure has served this purpose effectively. It is believed that such a procedure, which parallels actual operating conditions, provides an "on-the-spot" standard adaptable to a variety of manufacturing operations in other process type industries.

The application will differ in each case. The sequence of production operations will determine the difference. However, the steps will be the same: to determine the basic data required, to schedule a selective sample of this data under controlled conditions, to set up a daily report record as a tally of the key factors reflecting actual day-to-day performance, and to evaluate the results by measuring the deviation at each point of control.

Controlling Factory Burden With Standard Costs

Control of factory burden costs offers more room for improvement than does control of either standard direct labor or standard direct material costs. Control and reduction of the latter are becoming more and more a matter of engineering and less a problem of operations. On the other hand, factory burden—including indirect materials and supplies, indirect labor of all kinds, supervisory and clerical salaries, insurance, rents, utilities, taxes and depreciation—continues to be subject to substantial reduction in most instances when the accounting department provides the proper analysis of burden variance from standards for each cost center. However, good control of burden costs rests on adequate analysis of the causes of the variances from standard. Such analysis is not practical when the standard burden rate is the sole basis for determining the budgeted allowances, since its use does not allow for the fact that burden costs cannot always be expected to correlate closely with production volume.

Use of Standard Burden Rate Ignores Facts of Cost Behaviour

The lack of correlation between factory burden costs and direct labor hours is due to the presence of fixed as well as variable characteristics in most factory expenses and the predominance of the fixed element in many of them. Although all manufacturing expenses bear a relationship to the volume of production (however remote on a day-to-day basis, as in the case of rent), some vary proportionately, others less markedly and some hardly or perhaps not at all within expected operating levels. Each cost center of a manufacturing concern incurs certain expenses which are intended to keep it fit and ready for production. These are the expenses of the center at zero volume and are its fixed burden. Increases in the amounts spent for the individual components of this fixed burden due to greater activity in the center or the appearance with production activity of wholly variable expense components, are the variable burden of the center.

The common use of a standard burden rate (or rates for each cost center) on direct labor, which will charge to production at normal volume the sum of fixed and variable expense to be incurred at that volume, results in an over-all variance at other levels which it is difficult to render informative. However, the use of a flexible budget basis for standard burden will provide knowledge of the detail of allowable fixed and variable expense of each cost center for all levels of activity, i.e. whether or not actual direct labor hours spent result in saleable merchandise and are the same as the normal upon which the predetermined rate was based. Those who use only the burden rate for control often contend that it provides a reasonable basis for controlling variances despite the absence of a separate allowance for fixed burden and detailed production level allowances for variable items, but there are a number of important matters on which an application of a burden rate will not shed light. For example, it does not disclose:

1. The types of expense which caused the over-all variance.
2. The part of the variance due to service departments' inefficiencies.

3. Lost burden absorption due to excess direct labor on the volume produced.

Good control of burden costs demands a knowledge of that portion which each of the above causes contributed to the total variance incurred, be known.

Although the burden rate for a cost center must, of necessity, be built up from rates for each type of expense incurred by the producing department, it is seldom that the users of the burden rate alone attempt to budget the various types of expenses through a break-down of the rate. A minimum amount of control of individual expenses is usually achieved by scanning of expense amounts and comparison with prior periods, but the results thus attained may be misleading if volume changes have not been given adequate consideration. As ordinarily used, a burden rate is a warning signal and a bookkeeping convenience, not a diagnostic tool. A better procedure would bring to the surface and make relatively complete use of the basic information which was needed to obtain the burden rate for a particular cost center. If one is reasonably confident of a burden rate of, say, $3 per direct labor hour for one of the operating units of which the plant consists he should be able to say what part of the $3 is for machinery depreciation or any other item of expense and then use the information to check against actual performance. Conventional use of the burden rate does not reach to this point, nor does it suggest analysis of this type.

Moreover, use of a burden rate merges cost center performance in respect of controlled expense with cost allocations from service departments. Each standard burden rate is predetermined to include allocation from service departments. The actual overhead of a producing department as accumulated for absorption also contains an allocation, from the actual overhead costs of service departments. Thus all excess costs, inefficiencies or unabsorbed fixed burdens of the service centers are distributed to the producing centers where they become a part of that center's burden variance. This procedure is obviously unfair to the producing center since it has no effective means of controlling the inefficiencies of the service centers. It is equally disconcerting to the foremen of the latter, inasmuch as it provides them with no accounting information to assist in refuting the claim too often made that the service centers contribute unduly to the total variance incurred. The net result is a lack of adequate control of burden in both producing and service centers.

Important Questions Left Unanswered

When a standard cost system is in use, it is customary to charge to burden the direct labor costs in excess of the standard direct labor for the volume produced. Such a procedure, however, ignores and obscures the basis for measuring the amount of burden absorption which was lost when the entire direct labor hours worked did not result in standard direct labor hours of saleable merchandise. To insist on determination of this amount may be treading on unfamiliar ground and may seem like an unnecessary extension of burden analysis, but it is conceivable that the entire unabsorbed burden of a cost center might result from this cause rather

than such better known reasons as excessive expenditures for individual items of expense, service department inefficiencies, or lack of a normal volume of production. If such is the case it undoubtedly should be made known to the management, but even in less obvious circumstances the information would be of definite value in the control of burden costs.

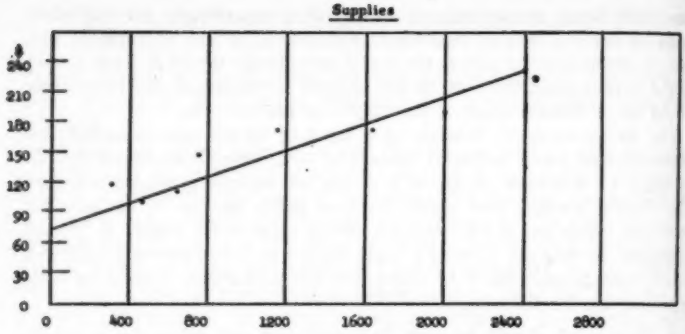
The shortcomings of reliance on a standard burden rate to control this important and partly neglected element of cost, serve to emphasize the advantages of a flexible budget as a means for controlling burden expenses. The former method does obtain the total dollar amount of variance for each cost center but it achieves little else of value in the control of factory expenses. It does not provide a ready answer to some important questions which management should be asking the cost accountant. Typical of these questions are the following:

1. How much should be spent in a particular cost center for a specific type of expense when a particular volume of production is achieved?
2. What was the percentage of normal production obtained during the month? How much of the variance was due to not reaching the normal production?
3. How much burden variance was incurred in the various service centers? Are the fixed expenses of the service centers being absorbed? Can they be in the foreseeable future?
4. What was the cost of excess direct labor hours in terms of lost burden absorptions?

Prompt and correct answers to these questions are of immense value in controlling burden, since they tend to place the responsibility for the various causes of burden variance where it belongs. The greatest enemy of cost control is lack of faith on the part of the lower level of plant management in the figures presented by the cost accountant. If the plant foreman feels that no effort is being made to set apart and relieve him of the responsibility for those variances over which he has no control, he soon loses any desire to reduce those which he can control. There is no incentive to improve performance when the improvement may be lost in the inefficiency caused by others. The flexible budget basis appears to be the best solution so far devised for obtaining the necessary information to do a really workmanlike job of controlling burden expenses and so to completely use standard costs, which have performed so well in respect of direct material and labor, for the entire cost control job.

Structure of Flexible Budget for Standard Burden Allowances

The task of preparing the original flexible budget standards need be no more complicated than the determination of a sound standard burden rate. Normal production volume is still the focal point. Once established, the allowances can be revised and improved upon, as experience is obtained, until they become a fairly scientific measuring device for the control of factory expenses at all levels of activity. A simple procedure would involve the following steps:



ACTUAL EXPENSES AT ACTIVITY LEVELS EXPERIENCED

D. L. hrs.	*$ at current buying power*
300	$110
450	100
650	108
700	140
1100	172
1650	170
2000	180
2500	220

EXHIBIT 1

1. Prepare a schedule for each expense in each service and producing cost center, showing the past history of actual expense incurred at the various activity levels stated in direct labor hours.
   a. Adjust actual expenses for prior years to reflect the current purchasing power of the dollar.
   b. Plot these adjusted expenses on a *separate* chart for each expense of *each* cost center in the manner illustrated in Exhibit 1.
   c. Draw a trend line to portray the effect of variances in prior years. (This trend line establishes a tentative amount of fixed expenses as well as the rate of increase for the variable expenses.)
2. Post the expense amounts for the various activity levels, as shown by the trend line, to a schedule of expenses for each cost center. Exhibit 2 represents such a schedule.
3. Total the schedules for each service department and compute the apportionment which must be made to the producing centers for product costing purposes, on the basis of expected use.
4. Total the schedules for each producing department and determine the standard burden rate (Yes, we do reach this point again but by a more useful route!) for each producing cost center, as follows:
   a. Determine the normal direct labor hours upon which the rate will be based. The normal should be the capacity of the plant to produce *and* sell rather than just to produce.

FLEXIBLE BUDGET BASIS FOR BURDEN RATE DETERMINATION

Direct labor hours.....	0	400	800	1,200	1,600	2,000	2,400
% of normal.....	0	20	40	60	80	100	120
Supervision	450	500	550	600	650	700	750
Depreciation	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Supplies	75	100	125	150	175	200	225
Power (includes some purchased power) ...	1,125	1,350	1,575	1,800	2,025	2,250	2,475
Indirect labor	200	250	300	350	400	450	500
Machinery maintenance	200	240	280	320	360	400	440
	$4,050	$4,440	$4,830	$5,220	$5,610	$6,000	$6,390

Overhead rate per direct labor hour:

Fixed element	$4,050	:	2,000 hours....	$2.025
Variable element	1,950	:	2,000 hours....	.975
	$6,000			$3.000

EXHIBIT 2

b. Divide the total expenses at zero activity by the normal direct labor hours to obtain the fixed burden rate.

5. Subtract the zero activity expenses from the expenses at normal to determine the variable expenses. Divide variable expenses by the normal direct labor hours to obtain the variable burden rate.
6. Add the fixed burden rate to the variable burden rate to obtain a standard burden rate for over-all application of burden.

Thus, we seem, in a sense to have come to the same end—a cost center burden rate. However, we have gone through detail which will be of more use than the end-products when it comes to the supremely important matter of interpretation for cost control. The separate fixed and variable burden rates obtained enable the cost accountant to determine a budget of expenses for any activity while continuing to use one standard rate for all movements in and out of the inventory accounts.

Examples: A Service Department and A Production Center

Exhibit 3 shows a flexible budget which might underlie the standard burden rate developed for charging other departments with the costs of a typical service department. The use of such a rate eliminates the transfer of some of the service departments' variance to the producing centers, which would happen if the service department actuals were spread to cost centers for variance determination, while at the same time giving the service department foremen some incentive to control their expenses. It does not, however, prevent "featherbedding" by the service department while working for other departments. Other means should be found to control this type of inefficiency. Probably the most effective would be alertness on the part of both foremen involved.

Exhibit 4 illustrates the use of the information obtainable from a flexible budget to analyze the variances of a producing cost center. This analysis

SERVICE DEPARTMENT FLEXIBLE BUDGET—POWER

Kilowatt hours	M	25 M	50 M	75 M	100 M	125 M	150 M
% of normal	0	25%	50%	75%	100%	125%	150%
Supervision .	$300	$300	$300	$300	$300	$300	$300
Powerhouse labor	140	172	204	236	268	300	332
Fuel	240	292	344	396	448	500	552
Water	60	76	92	108	124	140	156
Supplies	40	70	100	130	160	190	220
Maintenance	25	50	75	100	125	150	175
Depreciation	100	100	100	100	100	100	100
Taxes	15	15	15	15	15	15	15
	$920	$1,075	$1,230	$1,385	$1,540	$1,695	$1,850

Normal cost per kilowatt hour:

Fixed element.....	$920	:	100,000 hours.....	$.0092
Variable element.....	620	:	100,000 hours.....	.0062
Normal charging rate.....				$.0154

EXHIBIT 3

shows the three major causes of a variance and the amount each contributed to the total variance and strikingly displays the inadequacy of unabsorbed burden as a sole indicator of performance. It is evident from the illustration that, although the burden was unabsorbed in the amount of $700.00, the amount actually spent on burden was $207.50 less than the amount budgeted for the activity attained. The latter figure is obtained by comparing the actual burden of $5,500.00 with the amount budgeted for 1,700 hours (actual direct labor hours) or $5,707.50. It should be noted that, through the use of the variable burden rate, it is possible to obtain a budget for any amount of actual direct labor hours. Fixed burden plus the product of actual direct labor hours and the variable burden rate equals the budgeted burden.

The analysis further shows that some of the variance was caused by excess direct labor hours. In other words, through inefficiency in the use of direct labor the opportunity has been lost to produce salable goods which would absorb burden. This is a common cause of burden variances which is often lost sight of when no analysis is made. However, it is important, if we are to know where to control variances, that we realize how much was due to this cause as well as to overspending or subnormal volume.

The last computation on Exhibit 4 shows the amount of the variance which can properly be attributed to the last-named factor. It is apparent in this illustration that the actual direct labor hours were 300 short of the predetermined normal of 2,000 hours. These hours carry a fixed burden rate of $2.025 each for a total of $607.50. Since the fixed expense is irreducible and spread over 2,000 hours, it is evident that 300 hours cannot be absorbed in this period, thus creating the $607.50 variance. If actual direct labor hours had exceeded 2,000 hours, the result would be a credit variance attributable to the over-absorption of fixed burden.

PRODUCTION CENTER STANDARD BURDEN VARIANCE ANALYSIS

Calculation of unabsorbed burden		
Actual direct labor hours		1,700
Standard direct labor hours in product		1,600
Standard burden rate (Exhibit 1)		$ 3.00
Burden absorbed		$4,800.00
Actual burden expenses		$5,500.00
Unabsorbed burden		$700.00
Analysis		
Expense variance:		
Actual burden	$5,500.00	
Budget for activity attained [$5,610 + (100 × .975)] (Exhibit 1)	5,707.50	$(207.50)
Efficiency variance:		
Excess D. L. hours × standard burden rate (100 × $3)		300.00
Utilization variance:		
Normal capacity direct labor hours	$2,000	
Actual direct labor hours	1,700	
	$300	
Fixed burden rate	2.025	607.50
		$700.00

EXHIBIT 4

A Common Sense Approach to Overhead Allowances

In weighing the value of implementing the standard cost system with a flexible budget basis for burden allowances, the cost accountant should remember that, unless sources of cost control trouble are clearly and accurately determined, any efforts made to reduce burden costs will be unnecessarily hampered. He should also remember that most of the procedures used in establishing flexible allowances are neither novel or theoretical, but have been used mentally or on scratch paper by most cost men in search of a good standard burden rate. All that the proponents of the flexible budgeting basis do is to set this work down in a systematic manner after more extensive research. They also make more frequent and constructive use of the information they have developed and are therefore likely to exercise much better control over their burden costs.

Contributed by FRANCIS F. RODICAN, *New Haven Chapter*

Spotlighting Scrap and Re-operation Variance

In recent years a great number of companies have turned to a standard cost method of accounting, particularly those with production line operations. In such a business rejections for defective workmanship, scrap loss, and re-operation usually bulk large in costs. It seems to me that the practice of accepting these costs as part of standard, with the result that the percentage allowance which is set does not appear in the variance account, does not properly reflect the actual picture.

I believe that more informative results would be obtained and more effort would be made to reduce this type of loss if the percentage allowance were carried through overhead and eventually to the variance account by the following entries, using reserve or clearing account technique.

Dr: Provision for rejects (or other losses)
  Cr: Reserve for rejects
    To set up provision for loss on rejected production
Dr: Reserve for rejects
  Cr: Inventory in process
    To charge actual losses for the period

In presenting a statement of variances, the disclosure would be as follows:

Overhead variance: Related to over or under absorbed (including $— provision for rejects).....$—

Such a procedure would call the item to management's attention with the result that proper action could be taken. In a detailed statement of the overhead variances, still greater attention could be given to the scrap and re-operation portion.

J. M. PENMAN, *Youngstown Chapter*

STANDARD COSTS FOR THE BARREL FINISHING PROCESS

by GEORGE H. WADSWORTH,
Factory Accountant
Oakville Co. Division Scovill Manufacturing Co., Oakville, Conn.

Batch size for the various processes involved in different finishes, as determined by foremen and engineering personnel, and batch cost as determined from the cost records—with allocations where necessary—form the keystones of the procedure described in this paper. Control uses of the standard cost data thus developed are treated and a form of weekly labor variance report is presented. An enumeration is given of six variance causes which foremen are instructed to watch.

ALTHOUGH plating costs have been treated in the past, the general subject of costing for barrel plating and finishing operations appears to have been missed. This is particularly significant in an area in which the costs have been little developed and discussed. With us, over a period of time, standard costs have proved to be most economical and satisfactory for cost control and pricing purposes in connection with the manufacture and finishing of small metal stampings and formed wire parts.

Engineering Determination of Batch Size Precedes Cost Rates

The starting point in developing any cost system is developing a proper unit of activity in terms of which to state costs and against which to apply them. We have found that the greater number of cost factors in barrel plating work are related to the barrel load or batch than to any other base. The amount of work estimated per batch conforms pretty generally to the capacity of the equipment used for the particular finishing operation and therefore labor, supplies, power and other costs for an operation all have considerable similarity from batch to batch. It is the maximum batch size appropriate to a particular part in a particular operation, that must be estimated before we can go on to develop operation cost rates.

We have found that our estimating is best co-ordinated by the general foreman or the chemical engineer in charge of finishing, who is in a position to get information from other sources as

CONVERSION CHART—VARIOUS GAUGES OF METAL STRIP TO SQUARE FOOT PER M PIECES

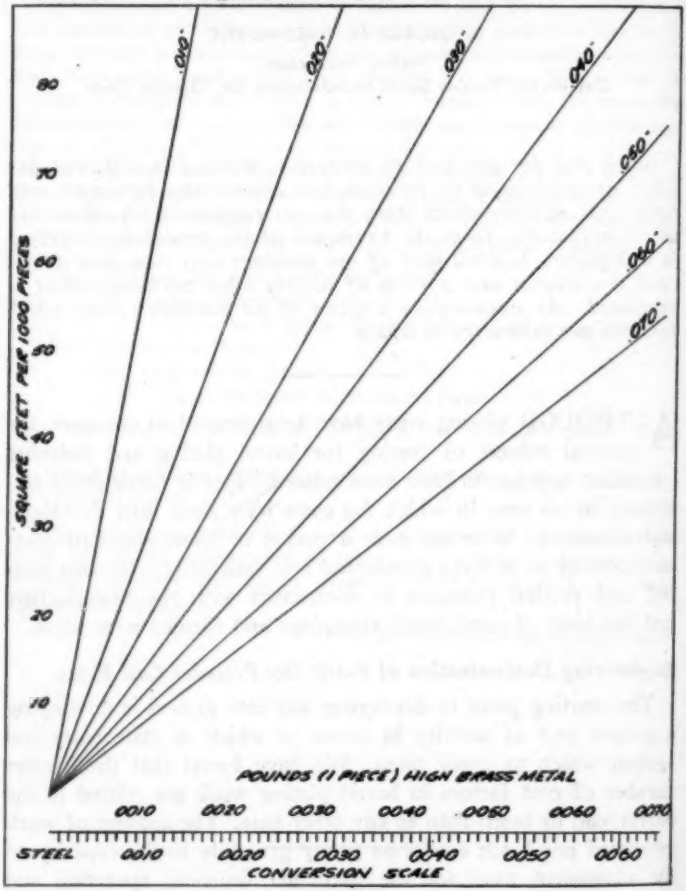


EXHIBIT 1

necessary. His job is to determine the appropriate process sequence for a given finish, and the size of the various batches in the sequence. Knowing the process, he must break it into operations by which it is most accurately described in the cost rates which have been worked up. (If the necessary operations do not fit existing cost rates, new rates will need to be developed. These rates are developed in the cost accounting department as will be outlined.)

Factors and Formulas for Process Capacities

Three factors govern the engineer in the selection of proper batch size for a given operation:

1. Capacity of a process in terms of surface area (usually plating).
2. Capacity of a process in terms of volume.
3. The nature of the work.

At least a general understanding of these three considerations in the determination of operation batch size will be helpful in connection with the subsequent description of the manner in which the standard cost rates are constructed. Each of the considerations is a limiting factor to batch size in particular instances.

The capacity of a process in terms of surface area applies to plating operations in which certain current density ranges must be maintained for satisfactory plating. In these cases, where we know the area capacity of the process, we can determine the capacity (pounds) for a given sample of product to be finished, by the following formula:

$$\text{Capacity (pounds)} = \frac{\text{Capacity (Square Inches)}}{\text{Square inches per piece} \times \text{pieces per pound}}$$

We have found charts like Exhibit 1 to be useful in this work. This particular chart is for use in determining the square feet of surface for sheet metal strip and covering gauges from .010″ to .070″. Similar charts can be designed for the differing materials used by individual concerns. Depending on experience and the nature of the work, it may be desirable to adjust the capacity as determined by formula by a flat percentages because of the fact that all of the surface is not continuously exposed in barrel plating.

The capacity of a process in terms of volume applies to cleaning and other rolling operations as well as to some plating operations. Here the bulk of the work determines the amount which can be handled in a given piece of equipment. In this case, where the volume capacity of the equipment is known, the volume of a unit of work to be processed can be determined in a standard container and the following formula applied to develop the maximum batch to be used in this case.

$$\text{Capacity (pounds)} = \frac{\text{Capacity (Cubic Inches)}}{\text{Volume per unit} \times \text{units per pound}}$$

ALLOCATION OF DEPARTMENTAL BURDEN

Cost center *Job description*	*86-1* *Clean*	*86-2* *Electro plate*	*86-3* *Roll bright*	*86-4* *Dry*	*Totals*
Number of personnel....	2	4	3	1	10
Indirect labor	$200	$400	$300	$100	$1000
Reclaim		200			200
Maintenance	200	700	150	50	1100
Payroll services	60	120	90	30	300
Power	100	1100	200		1400
Fixed charges	150	200	100	150	600
Total burden	$710	$2720	$840	$330	$4600
Normal batches	1970	2640	1805	2300	
Cost per batch.....	.360	1.030	.465	.143	

EXHIBIT 2

Here, likewise, the use of a percentage arrived at through experience may be necessary to adjust the computed batch size to one sure to receive proper rolling action.

There will always be cases where the nature of the work, itself, limits the amount which can be finished at one time. Sometimes it is possible to establish known limits for particular categories of work. At other times the limits must be determined empirically, on the basis of experience of the estimator. Typical items and operations of this sort are:

1. Straight wires which are subject to bending during rolling.
2. Open rings, hooks, etc., which are subject to tangling and therefore incomplete finishing action.
3. Flat surfaces which cling together and impede proper cleaning and plating.

Each of the above factors is weighed in estimating batch size for a new item or in attempting to standardize classes of items into those of similar batch size for finishing purposes.

Development of Operation Cost Rates Per Batch

The batch as a unit of activity represents the unit against which we must apply all cost elements. In Exhibit 2, we see a typical department, No. 86, in terms of its cost centers representing the various types of work done. (In finishing work there are usually other sequences besides plating. Therefore work may be handled in some of the cost centers which does not go through the electroplating cost centers.)

At the left, there are listed the various burden factors which

COMPUTATION OF OPERATION COST RATES

Rate Group / *Description*	*86-1-1 Clean brass*	*86-1-2 Immersion clean*	*86-1-3 Clean steel*	*86-1-4 Special clean*
Hours per batch	.244	.100	.242	.333
Productive labor	$.349	$.143	$.346	$.476
Fringe benefits	.025	.010	.025	.035
Finishing supplies	.424	.200	.724	.350
Burden	.360	.360	.360	.360
General overhead	.220	.135	.276	.232
Total rate per batch	$1.378	$.848	$1.731	$1.453
Use	$1.40	$.85	$1.70	$1.50

EXHIBIT 3

are to be distributed to the cost centers indicated. The top line shows the number of productive workers in each cost center. This is the basis for the distribution of indirect labor and payroll services. The other elements are distributed on the basis of individual studies of the costs involved. The totals of all burden elements in the various cost centers are applied to the normal number of batches going through the respective centers to arrive at a burden rate for one batch of work for each center.

In Exhibit 3, which shows the cleaning cost center broken down to operations, these burden rates are combined with the direct elements of costs to arrive at a total cost per batch. First the hours per batch are determined from time study information or from observation by the foreman and represent the productive labor time spent in handling a barrel of work in a particular type of operation. These hours are extended by the applicable labor rate to obtain labor cost per batch. On the next line is shown holiday pay and other fringe benefits which will apply to the labor rate. Fnishing supplies per batch are computed from experience, where available, or on new rates from such chemical data as may be available on consumption of these items. Since each cost center is set up to handle uniform types of operations, the burden rates developed in Exhibit 2 for each cost center are applied to all batches in that cost center. In this case the figure is $.360, which appears in each column of Exhibit 3. General overheads are applied as a percentage of all other costs since they represent items which cannot be allocated more specifically to individual departments. As will be noted, the totals representing aggregate batch rates for the operation are rounded off. This is for convenience

WEEKLY LABOR VARIANCE REPORT

S 130—Productive Labor

Rate Group	*86-1-1*	*86-1-2*	*86-1-3*	*86-1-4*	*Total*
Hours per batch.....	.244	.100	.242	.333	
Batches	96	95	55	100	
Man Hours earned...	23	9.5	13	33	78.5
Man Hours charged...					80.0
Labor variance					(1.5)

EXHIBIT 4

in cost accounting, and on the theory that errors caused by this simplification will average out.

Cost Rates Per Thousand Pieces and Costs for Pricing

With the cost rate per batch for the operation established, it is now possible to apply it to product units. The first operation listed above is described on the process records as "86-1-1 Clean for Plate—50." The figure after the operation title is the weight of product per batch. This is the point at which the engineers, estimate, dealt with at the start of this article is brought to bear on costs. In this case it is 50 pounds. The unit cost per piece for the operation is developed from this information by using the rate obtained in Exhibit 3 and the following formula:

$$\frac{\text{Cost per batch}}{\text{Pounds per batch}} \times \text{Pounds per M pieces} = \text{cost per M pieces}$$

Substituting figures, the cost of cleaning for plate for an article weighing 1.25 pounds per thousand pieces would be $\frac{1.40}{50} \times 1.25$ or $.035 per thousand pieces. In establishing selling prices, the administrative overheads are added to this unit cost on a percentage basis.

Effecting Cost Control

Cost control is now readily obtainable through the medium of the standards developed above. Weekly labor variance reports in terms of labor hours are developed as indicated in Exhibit 4. To illustrate, we will assume that work has been performed in the various categories during the previous week as indicated by the number of batches shown in the second line.

The product so expressed in batches is converted to earned hours on the third line by use of the standard hours per batch which have been mentioned and which are shown on the first line of Ex-

hibit 4. These earned hours are compared with the actual hours worked for the same period. The resulting labor variance may be broken down by cost centers if it is desired and we have found that from time to time this is of considerable help, although not necessary as a general rule.

Supplies are controllable in the same manner by measuring the standards against the actual supplies used. A maintenance report has been prepared monthly along the same lines and the use of standards is of considerable assistance in deciding whether maintenance costs are out of line.

In all our cost control, we have emphasized that controllable costs are controllable by the factory organization but not exclusively by the foreman. An extract of our instructions to foremen follows:

1. Foreman should know *reason* for variations.
   (a) Accuracy of estimate or deviation from standard operations.
   (b) Variation of batch size from standard.
   (c) Personnel distribution.
   (d) Production demands interfering with most economical performance.
   (e) Inadequate equipment.
   (f) Poor work performance.
2. Foreman corrects conditions within his control.
3. Foreman brings conditions beyond his control to the attention of the superintendent.

Costing and Control Objectives Attained

The standard cost system outlined above is a uniform system for costing purposes which has shown good results in the area of cost control, as well as of product costing and pricing. The refinement of this system through the estimating of various batches and the establishment of batch cost rates by cost centers and operations, has provided very accurate costs over a period of time with much less clerical effort than would be involved under job costing procedures.

Daily Reporting of Labor Variance

In order to control labor more effectively, a daily labor variance report was adopted by our company, a medium-size manufacturing unit. This labor report, prepared in the plant and forwarded to the cost department each morning for the previous day's work, covers both direct and indirect labor and is issued not only to control labor cost but also helps to apply it to the different production orders. The report is prepared on a form 6" x 10" and essential information such as date, department, shift, etc., is listed across the top. The upper portion of the body of the form is used for direct labor and has the following headings:

1. Production order.
2. Item produced.
3. Quantity.
4. Earned hours.
5. Standard hours.
6. Variance.

Production that is not at standard is readily apparent and a follow-up report is immediately sent to the foreman through the plant superintendent in an effort to obtain information as to the cause of the unfavorable variance. Since the report concerns the previous day's work, the events should still be fresh in the foreman's mind. Causes for the variance can be divided into those which the foreman can control and those he cannot control. Whether it be management's responsibility or the foreman's responsibility, the cause for the variance is brought out promptly and corrective action can be taken.

The lower portion of the form is ruled to permit a 3" x 6" section to be used for indirect labor. We have a budget for indirect labor and, from the report, daily indirect hours reported are posted to a spread sheet and compared weekly with the budgeted indirect labor hours. This weekly comparison of indirect labor to budgeted indirect labor affords the following information:

1. Actual indirect labor hours for the week.
2. Budgeted indirect labor hours for the week.
3. Hours over or under for the week.
4. Actual indirect labor hours for the period to date.
5. Budgeted indirect labor hours for period to date.
6. Hours over or under for period to date.

This weekly report is given to the plant manager, each foreman concerned and the budget director. It is an effective means of enabling those responsible for indirect labor to control it. Thus the simple device of reporting labor hours daily, whether direct or indirect, forms a firm basis for prompt control action.

B. E. HATFIELD, *Chattanooga Chapter*

OPERATING CHECKUPS AND STANDARD COSTS CONTROL PLATING SILVER IN PROCESS

By GORDON P. CUSHMAN,
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Control of purchased material, especially when in process, is always an important cost factor but particularly so when the material is a precious metal. In this article there is outlined a procedure through which, between the annual dates as of which all factors can be more precisely determined, control of plating silver is maintained on a rather exacting basis. The standard cost of items processed, the readings of plating meters, and a physical inventory together form a three-way monthly check, and special control devices are used at particular points as set forth in the text of the paper.

THIS article presents and will attempt to describe one phase of plating control, the method of accounting for silver anodes and silver cyanide in process used in electroplating silver flatware at The International Silver Co. We will not consider any of the earlier operations in the manufacture of silver plated flatware but will start with the article finished in base metal, ready for silver plating. The chief operations from this point to finished stock are *strike plate, base plate, sectional plate, compound finish,* inspect, and wrap. We are interested in the control of silver through the first four of the preceding operations.

Base Plating

The science of electroplating is a delicate balance of variable but controllable factors. The process consists of suspending a metal article, such as a teaspoon, in a chemical solution with a bar of pure silver. An electric current passed through the solution causes the bar of silver (or anode) to disintegrate and to be transmitted in molecular state through the solution and deposited on the spoon (or cathode). The amount of electric current passing through the plating solution and the length of time the articles are left in the tank determine the thickness of the silver deposit. In actual practice, as many as forty to fifty dozen spoons may be plated at one time in a small size plating tank.

The silverware is suspended in the solution on metal racks which

hold, say, two dozen spoons and through which the electric current passes. The portion of the rack which extends into the solution is itself plated with each batch of spoons plated. By periodic "stripping" of the racks (a process by which the rack is "desilvered" by electrolysis, with the current reversed) this silver, called "cathode strip," is recovered and made available for re-use through refining. A rack cannot be used too long before stripping because, as it builds up in size, it will pick up more silver and the spoons will pick up less, due to the difference in comparative area, with the result that the goods may be under-plated.

The plating bath is a solution of silver cyanide and potassium cyanide. The richness of the solution is expressed in ounces of silver per gallon of liquid solution. Under well-controlled operating conditions, the silver which comes from the anode is plated on the cathode (goods and racks) with little or no change occurring in the strength of the solution. However, if the anodes are allowed to be worn down too thin before they are replaced, silver will be plated out of the solution and more cyanide will have to be added to bring it back up to strength. Another factor which weakens the solution is "drag-out" i.e., the silver in solution which adheres to the goods and rack when the rack is lifted out of the plating tank. Silver thus dragged out is reclaimed by frequently piping the water from the rinse tanks to a storage tank and then recovering the silver by chemical precipitation or electrolysis.

Strike Plating, Sectional Plating and Buffing

The foregoing is a brief summary of the main operation of base plating. Two subsidiary plating operations are strike plating and sectional plating. It has been found that the base metal reacts better to the plating process and a better plate is assured if the article is first given a quick flash or "strike" coating of silver in a weak solution at a high amperage. All goods go into the strike tank before base plating. Section plate or spot plate is a substantial extra coating of silver over the base plate at the wear points, such as the base of the bowl and the tip of the handle of a spoon, which is added after the base plate.

After plating, the goods are given a final buffing. This is an operation which is done mechanically with cloth buffs and unavoidably rubs off some of the silver plate. Buffing, like the plating itself, creates an engineering and an accounting problem. The silver must be reclaimed from the wornout buffs and from the buff dust

collected in the exhaust system. Also the amount of "buff-off" must be provided for when the article is plated so that the finished article has sufficient silver plate to meet quality standards.

Occasionally articles will be improperly cleaned before plating or the plating solution will go bad so that poor plate results. In this case the goods are stripped by immersion in acid, cleaned and replated. The stripped silver is reclaimed from the acid by refining. It is not always practical to strip and, in such cases, additional silver is plated over the original silver.

Issuance of Silver into Process and Return to Vault

As has been indicated, we are concerned in this article primarily with control over silver while in process but a few paragraphs describing the transfer in and out of process will make further discussions clearer. The receipt of metallic silver and silver cyanide, their storage, and their issuance into process are handled in a controlled manner. Silver anodes and silver cyanide are kept in a vault in each factory and issued to process as requisitioned by the plating room foreman. Silver anodes and the silver content of silver cyanide purchased are charged to a raw material account entitled, "plating silver in stock," at standard cost. This account is credited when anodes and cyanide are requisitioned by the plating room, the off-setting debit being the process account "plating silver in process and plating solutions."

In production, when the anodes become worn down to a size too small for efficient plating, they are removed from the tanks and put back into the vault for subsequent return to the refiner. Movement of silver into and out of the vault is summarized on a monthly vault report. The totals of the transactions recorded on the vault report are the basis of a monthly entry transferring the net ounces of silver from raw material into process. This figure is the net result of anodes and cyanide issued to the plating room, less scrap anodes returned to the vault. Whenever scrap anodes are shipped out for refining, the raw material account is credited and, at the end of each month, a physical inventory of the vault is taken which must agree with the raw material account.

Operation of the In Process Account

The work in process account is cleared by a monthly entry to finished stock and by periodic credits for refinings shipped from process. Thus it may be seen that work in process inventory is in

Summary of Anode Silver in Process Account and Analysis of Silver Shortage

Year 1949
(Troy ounces)

Inventory, January 1		294,000
Transfers from vault (net)		2,993,000
		3,287,000
Less—Finished stock transfers (Including loss provision 205,000)	2,664,000	
Refining recoveries	455,000	
Goods replated without stripping	12,600	3,131,600
Book inventory, December 31		155,400
Physical inventory, December 31		284,000
Physical over book		(128,600)
Eliminate provision for silver losses		205,000
Physical shortage		76,400
Percentage shortage to finished stock transfers (net)		3.1%
Less: Other losses not recorded but allowed for in silver loss provision eliminated above		
Strikes		(19,000)
Processing losses (detailed on Exhibit 2)		(28,400)
		(47,400)
Difference unaccounted for		29,000
Percentage to finished stock transfers (net)		1.2%

(*All figures hypothetical*)

Exhibit 1

one of four conditions (1) anodes in the tanks, (2) silver in solution in the tanks, (3) "white stock" or silver plating on goods which have not been transferred to finished stock, or (4) silver-bearing waste material held for reclaim or refining.

At the end of each month, Items 1 and 2 above are inventoried, but, in the absence of a complete physical inventory of articles in process and of scrap on hand, it is not possible oftener than once a

year to prove the entire silver in process account, for the reason that the value of white stock is not known nor is it assured that all silver-bearing materials have been returned and that recoveries from refinings have been credited to the current month. At the end of the year, when a complete inventory is taken, the silver value of white stock (together with any silver out for refining) is computed and added to the plating room silver for comparison with the book balance, at which time a complete summarization of the year's silver transactions is made (Exhibit 1). This is supported by Exhibit 2, also annual, but, as will appear, there is a practicable means of monthly control as well. Each factory is instructed to send back all buff dust, sweeps, cathode silver and other materials for refining just as near the end of the year as practicable and books are kept open until the final credit is received from the refiner.

Engineered Plating Quantities and Plating Room Standards

In our company there are at present four factories engaged in plating activities. Three of them plate flatware only (spoons, forks, etc.) and the fourth plates cutlery and holloware. While there are special technical problems peculiar to the plating of cutlery and holloware, no attempt will be made to cover them in detail here, as the basic accounting problems are the same as for flatware plating. There are three considerations involved in setting up basic quantity standards for plating: (1) the size of the article, (2) the use to which it is to be put and (3) the general quality standard of each line. The surface area is carefully computed by the engineering department and the desired thickness of plate taken into consideration in determining the base plate. Prospective usage is an important factor in arriving at the thickness of plate desired. A dinner fork, for example, is plated thicker than an oyster fork because it is used more often and is, therefore, subject to greater wear.

The amount of plate desired on the finished article is expressed in pennyweights per dozens, a pennyweight being 1/20th of a troy ounce. Thus a teaspoon in a first quality line might have a base plate of twenty pennyweights per dozen (to use a hypothetical figure), an intermediate quality line fifteen pennyweights, and so on. Allowance is made also for sectional or reinforcing plate. The twenty pennyweight teaspoon might have an additional three pennyweights of sectional plate for a total finished stock standard

SILVER PROCESSING LOSSES OR GAINS
YEAR 1949
(Troy ounces)

		Percentage of recovery	Loss or (gain)
Anode silver used			
Actual anodes used in plating room (except strikes), based on physical inventories	2,888,000		
Plating room standard silver used, including allowances for racks and finishing	2,903,000		
Underplate (or excess allowances)			(15,000)
Silver in solution used			
Actual silver in solution used (except strikes), based on physical inventories	70,000		
Refining recoveries from precipitating tanks and plating room sweepings	59,500	85%	
Loss from Dragout			10,500
Rack allowance and recovery			
Rack allowance (included in plating room standard above)	119,000		
Recoveries from rack strip	113,050	95%	
Excess allowance for rack take up (or failure to reclaim)			5,950
Finishing allowance and recovery			
Finishing allowance (included in plating room standard above)	77,000		
Recoveries from blower dust, worn buffs and compound room sweepings	50,050	65%	
Excess allowance for finishing (or failure to reclaim)			26,950
Total processing loss supporting item in Exhibit 1			28,400

(*All figures hypothetical*)

EXHIBIT 2

of twenty-three pennyweights. No allowance is made in the finished stock standard for strike silver because the quantity of silver used per dozen pieces plated is too small to be measured accurately. The control of plating from the technical side requires, first, that accurate plating standards be set and, second, that the plating engineers and foremen closely control the actual silver used, to conform to the standards set.

In establishing the proper plating room standards to effect the quantity standards just described for each group of articles to be plated, three further factors must be considered: (1) the consumer or finished stock standard, that is, the basic plate which should be on the goods when they are finished and ready for sale to customers, (2) the amount of silver which will be buffed off in the finishing operations and (3) the amount of silver which will be plated on the racks. The plating room standards are the sum of the three factors. In attempting to conform to the standards set, plating foremen may closely approximate over-all usage of silver, yet be off on the finished article because the racks are receiving too much or too little silver. Also even though the amount of silver plated on the goods is accurate, too much or too little may be buffed off in finishing operations. In order to assist the manufacturing and engineering personnel in controlling these factors, the following individual controls have been established:

1. Gross silver used in the plating process.
2. Silver plated on the racks.
3. Silver drag-out.
4. Silver buffed off in finishing operations.

Close control in the plating room is essential because underplating and overplating are equally undesirable. If goods are underplated the customer does not get full value and there is further danger of cutting through the plate in the buffing operations. If goods are over plated the company is losing money through excessive silver usage, not contemplated in the cost or sales price.

As a control of plating accuracy, each plating tank is equipped with an integrating meter which records in pennyweights the amount of silver plated on each batch (including racks) and an accumulative total. A daily check is maintained of each plating meter by multiplying the number of dozens by the plating stand-

Monthly Report of Silver Used in Plating
(Troy ounces)

Inventory—December 1, 1949:		
Anodes in tanks	87,000	
Silver solutions 5,000 gal. @ 6 oz. per gallon	30,000	117,000
Silver withdrawn from vault:		
Anodes	319,000	
Cyanide (silver content)	2,000	
	321,000	
Less scrap anodes returned to vault	57,000	264,000
Total		381,000
Less Inventory—December 31, 1949:		
Anodes in tanks	80,000	
Silver solutions 5,000 gal. @ 5.6 oz. per gallon	28,000	108,000
Total actual silver used		273,000
Standard silver usage (based on quantity plated)		265,000
Loss (3.0%)		8,000
Usage indicated by plating meters (memo)		266,000

(*All figures hypothetical*)

Exhibit 3

ard per dozen and comparing the result with the daily meter reading. If any serious deviation occurs, the meter is checked and repaired immediately. If it were not for this daily comparison of metered and standard silver usage, it would not be known that the plating control was off until the end of the month when a physical inventory is taken. Based on the monthly physical inventory the actual gross silver used is compared with the plating room standards (quantities plated for the month times unit standards). As noted before, these standards are plating room standards and include some amounts ultimately recoverable. A monthly report (Exhibit 3) summarizes this three-way check of silver used in the plating room. The standard silver and metered silver accumulated from the daily reports are compared with the actual silver used based on physical inventories. It is normal for this last figure to

exceed the metered quantity due to drag-out, but if the difference is too great the engineering department is requested to investigate. The monthly checkup is strictly a control—an operating checkup. Complete determinations of losses (as shown in one figure on Exhibit 1) is on an annual basis as is the separation of losses to causes as is shown in Exhibit 2. These causes, however, also require running control and this is achieved as indicated in the following paragraphs.

Comparison of Rack Allowance with "Stripping" Recoveries

Further control is in comparison of the rack allowance with silver recovery. As previously mentioned, it is possible to have good overall plating control and yet plate too much silver on the racks and not enough on the goods, or vice versa. Therefore, frequent tests are made of deposit on the goods and deposit on the racks, and racks are stripped frequently. The over-all accuracy of the rack allowance is checked periodically throughout the year, and more accurately at the end of the year, with the total recovery of silver from refinings of silver stripped from racks.

Comparison of Silver Cyanide Added With "Dragout" Recoveries

The third point of control is in comparison of dragout or silver solution removed from the tanks with the goods, with recovery thereof through refining. Dragout is either caught in pans, dropped on the floor, or washed off in the wash tanks. In the absence of any abnormal conditions of the plating equipment, the total quantity of silver added to the plating solutions in the form of silver cyanide represents replenishment of silver lost in dragout. Dragout recovery is aided by the installation of drip pans around the plating tanks and rinses. In addition, effort is made to reclaim as much as possible through settling tanks, as has been described. Comparison of total silver added as cyanide with the silver recovered by refining from the rinse tanks shows how much is being lost from dragout. A small amount will be lost due to solution spilled on the floor and on clothing, shoes, aprons, etc., but if recovery of silver through refining the rinsing solutions is inadequate, investigation must be immediately begun to discover the source of this loss.

Comparison of Finishing Allowance with Silver in Sweepings

The final point of special control is in connection with silver buffed off in finishing operations. In addition to frequent tests by

LABORATORY REPORT ON
REFININGS OF WASTE MATERIALS
(Troy ounces)

	Weight Shipped	*Ounces Silver reclaimed*	*Refining charge*
Class 1—Solutions:			
Acid strip (from goods)...	150,000 lb.	258,000	$9,000
Settling tanks (from drag-out)	13,000 "	58,500	1,600
Class 2—Dry bulk materials:			
Plating room sweepings...	3,000 lb.	1,000	200
Blower dust and compound room sweepings	160,000 "	50,050	8,000
Class 3—Cathode silver:			
Rack strip	140,000 oz.	113,050	2,000
Totals		480,600	$20,800

Average per cent silver in material shipped 9.5%
Refining cost per 1,000 oz. of silver ..... $ 43.28

(*All figures hypothetical*)

EXHIBIT 4

the laboratory of silver on individual articles of finished goods, the adequacy of the finishing allowance is checked periodically by comparing the total standard allowance with the total ounces reclaimed from dust collectors of the exhaust system, worn buffs, and sweepings from the buffing room. If proper control is being exercised, a fairly definite high percentage of recovery should result.

Silver Yield from Shipments to Refiner

When a shipment of any silver-bearing material is sent to the refiner, the factory prepares a pre-numbered "silver refining report" containing all the pertinent shipping data, including the net weight of the material shipped. From past experience it is known approximately what the silver yield should be from each type of reclaim material and, furthermore, the laboratory has samples from the factories of each lot returned and is in position to question any refining credits which do not agree with its analysis. The refiner makes use of the "silver refining" number when reporting back the quantity of silver recovered, and it is therefore possible to keep track of recoveries by lot.

A monthly summary of silver refinings is prepared which shows by class the total recoveries for the month and for the year to date, together with the refining charge. Copies of this report are furnished to the laboratory and to the factory managers. This report is also the basis of the laboratory's annual report (Exhibit 4) which gives comparative data by factory on ounces of silver refined per pound of waste material returned, and the cost per ounce of silver reclaimed.

Sundry Known and Unknown Losses

Silver which is plated over silver, due to the impracticability of stripping is a known loss and is charged off monthly whenever it occurs. Another known loss but one not specifically provided for, is silver used in strike plate. This is not charged off regularly but the amount used is computed and recognized as an explainable portion of any silver difference.

Other losses not ascertainable are losses in refining, failure to completely strip items before replating, possible theft, and clerical errors such as reporting wrong quantities and use of incorrect standards in computing finished stock, as well as straight mathematical errors. The monthly transfer from silver in process to finished stock is the result of multiplication of the number of articles completed, by the unit finished stock standard plate. To this total is added a percentage provision which anticipates losses of silver in process. This provision is for accounting purposes only and is not considered in making analysis of actual silver losses at the year end.

Continually Closer Control Effected

A plating committee consisting of top factory management and engineering and laboratory personnel, meets regularly to discuss new plating techniques and improvements. Co-operation between factory accountants, plating room foremen, and the general accounting department in the preparation of monthly, quarterly, and annual reports has been effective in supplying the plating committee with performance figures which have helped to minimize silver losses. By giving close attention to the details of silver plating, the production and engineering departments, with the help of accounting reports, have reduced the amount represented by unknown losses substantially in a three-year period, and still more savings are looked for in the future.

ARTHUR W. ACKERMAN (Providing A Working Knowledge of Standard Costs for Plant Supervision) is Secretary and Treasurer of L. A. Young Spring and Wire Corp., Detroit, Michigan. He was appointed to this position in 1946 and has been with his company for a ten-year period. Mr. Ackerman is a Certified Public Accountant of Michigan and has had experience in the public as well as the corporate accounting field.

B. H. DISBROW and JOHN-B. VAN HAELEN (Integration of Standard Costs With Entry and Closing Routine) are associated with the Curtiss-Wright organization at Wood-Ridge, N. J. Mr. Disbrow is Budget Manager Propeller Division, Curtiss-Wright Corp., and Mr. Van Haelen is Tax Accountant. Both authors have served in various accounting capacities with Curtiss-Wright companies over a period of more than ten years.

D. S. BRIGHAM and KENNETH CONNERS, SR. (A Standard Cost Procedure Which Facilitates Handling of Production Orders) are, respectively, Works Accountant and Supervisor of Costs, Trumbull Electric Manufacturing Co., Norwood, Ohio. Mr. Brigham joined his company thirteen years ago after fifteen years of prior experience in industrial accounting. Mr. Connors has had twenty-three years with Trumbull, having served as General Accountant, Purchasing Agent, and Materials Supervisor.

JAMES F. MERRICK (An Application of a Basic Standard Rate to Direct Labor) is Supervisor of Costs, Monroe Calculating Machine Co., Orange, N. J. Mr. Merrick has been with his company for a service span of seventeen years. During World War II, he spent three years overseas with the Finance Division of the Army of the United States.

LAWRENCE C. ERNE (Test Runs Supply Basis for Standard Costs In A Bakery Operation) is Assistant Treasurer and Cost Accountant, Perfection Biscuit Co., Fort Wayne, Ind. Mr. Erne has had long service with his company, and held a number of accounting posts and carried out a variety of special assignments before becoming Head of the Cost Department in 1940.

GEORGE H. WADSWORTH (Standard Costs for the Barrel Finishing Process) is Factory Accountant, Oakville Co. Division, Scovill Manufacturing Co., Oakville, Conn., with which he has been connected for the past four years. A graduate of Harvard College and of the Harvard Graduate School of Business Administration, Mr. Wadsworth served as an Officer in the U. S. Navy during World War II.

GORDON P. CUSHMAN (Operating Checkups and Standard Costs Control Plating Silver in Process) is Chief Cost Accountant, International Silver Co., Meriden, Conn., with which he became associated in 1942 after two years service with the British Purchasing Commission as head of the Machine Tool Accounting Section during the early months of World War II. His previous industrial accounting experience was in textiles, screw machine products and battery manufacturing. For four years he was with the Chase National Bank and Chase Securities Corporation, New York, N. Y.

THE COST FORUM

Inventory Valuations and Revision or Conversion of Standard Costs

Editor, N. A. C. A. Bulletin:

The general accountant (primarily interested in the balance sheet and operating statement) will usually agree with the cost accountant that standard costs present the most effective medium for dealing with costs as such and with their control, but all semblance of agreement will frequently disappear when the paths of the two accountants cross in the field of inventory valuation. The general accountant (and, in most instances, the Bureau of Internal Revenue) will stoutly maintain that the inventory should be valued on a cost basis according to one of a number of known methods. The cost accountant on the other hand, will insist that the inventory at standard is true cost.

This difference of opinion is one of viewpoint. The general accountant sees the aggregate cost of materials, labor and manufacturing expense and to him, the inventory should represent the cost of such elements as can be prorated to the product on hand at the inventory date. To the cost accountant, the inventory at standard is cost because current differences between standard and acquiring cost are properly explained as resulting from unusual or remediable conditions. To him, these differences, known as variances, have been absorbed in operations and therefore no longer exist for balance sheet purposes.

However, standards must be kept up-to-date if this is to be a sound position. In many standard cost systems, the standards are changed infrequently. Some standards being used today have not been changed for five or more years and, considering the trend of all costs over that period, such standards are a far cry from actual costs. If considered for inventory valuation they form a sort of automatic "lifo" basis, a function hardly appropriate to standard costs. Certainly any inventory developed on those standards can be deemed conservative but, in modern accounting the hidden asset is no longer welcome in the name of conservatism. If costs continue their rise, the difference between unrevised standards and current actual costs will become ever greater and soon any attempt to reset standards on a current basis will involve the problem of a substantially increased inventory at standard. If, by any inadvertence, these standards have been masquerading as approximate actual cost for tax purposes the additional taxes involved will tend to thwart any attempted realistic or honest adjustment. Hence, in these cases, the so-called standards will more and more obviously fail of being true costs and, if used for inventory valuation, can only disparage standard costs as a method.

However, there is a way of relating standard and actual cost for inventory valuation purposes under which actual costs are used from period to period but are derived from the standard costs in use and from the variances developed. Employment of this method will uphold the prestige of standard

costs, however distant the last revision, by measuring the departure from current costs and will result in a current cost inventory.

The technique of reflecting inventories at actual cost when a standard cost system is used is quite simple. In brief, the cost of goods sold account is resolved to the elements of material, labor and manufacturing expense. Such an analysis will present the variances between standard and actual cost of the elements involved. The variances are compared to the corresponding standard costs of materials, labor and manufacturing expense applied during the period and the per cent of variance is obtained. These percentages are applied to the standard value of each element in the inventory and the resulting total becomes the excess of actual cost over standard cost and should be an addition to inventory. The account representing this addition to the inventory will be reflected on the general ledger and will not be a part of the cost records. If the procedure is applied on an annual rather than a monthly basis, it is necessary to examine the percentages somewhat closely to make sure they are not unduly affected by conditions early in the year.

Fundamentally, I believe, there can be only one inventory cost and it must have some relationship to the actual expenditure involved, an inventory valued at standard cost may be neither "fish nor fowl." Where management has resisted the temptation of present tax savings, if at any time the standards in force have been regarded as cost by the Bureau, and has attempted either to revise standards currently or to adjust standard inventories to current costs, a more progressive and realistic attitude toward present day fiscal problems will be found.

E. H. Heilman, Jr., *Hartford Chapter*

Making A Start With Standard Costs

Editor, N. A. C. A. Bulletin:

Standard costs have been given wide acceptance for many years in many larger companies. It is surprising how many smaller companies and some large ones are still using antiquated methods or rule of thumb cost control. Cost control, of necessity, must come from the cost accountant's records and he should exercise leadership in initiating the program as well as in controlling and reporting cost information to management. Too often cost accountants are content to let management get into difficulties and undergo the expense of retaining consultants who obtain data from the cost accountant and, applying both sense and science, convert the unknown into the understandable. On the basis of this an informative report is issued.

Perhaps in many companies the cost staff could well have turned the trick with the help of well-assembled information including that provided by standard costs on an estimated basis. In some companies it is thought that it is necessary to have a large engineering staff to establish standards for an installation of standard costs. While it is desirable to have adequate tools to do a job, it is not always necessary to have full paraphernalia to secure a reasonably sound answer. Noting first that results are naturally proportionate to equipment, it can nevertheless be said that standard costs

for cost control purposes can be made available to management without an elaborate setup.

Even in engineered standards there is room for error because of the element of estimate in personal time allowances and in respect of breakage or scrapping of materials. It may be necessary for the cost accountant to run the same risk with respect to material and labor (which engineers could handle with relative exactness) and to do a little estimating in these areas, too, with the help of other company personnel—to arrive at initial standards which will commend themselves to management as demonstrating the serviceability potentials of standard costs. It may help to illustrate with a specific process in which, as may often be the case, appropriate quantities are readily obtainable. For an example, reference is made to a lithographed steel waste basket.

The cost accountant knows the cost of steel and how much is required for the unit quantity. This may be 100 pieces. Just as soon as the blanks are coated and cut and the issued and processed weights have been recorded, the material variation can be calculated. It is not necessary to wait until the material has gone through subsequent operations.

To compute the variance, calculate the steel, paint and ink usage and compare estimated standard cost with the actual cost, as follows:

STEEL VARIANCE

Usage variance—		
Standard price X Standard weight	XXX	
Less: Standard price X Actual weight	XXX	
Usage gain or loss		XXX
Price variance—		
Standard price X Actual weight	XXX	
Less: Actual price X Actual weight	XXX	
Price gain or loss		XXX
Total variance		XXX

PAINT VARIANCE

Usage variance—		
Standard price X Standard gallons	XXX	
Less: Standard price X Actual gallons	XXX	
Usage gain or loss		XXX
Price variance—		
Standard price X Actual gallons	XXX	
Less Actual price X Actual gallons	XXX	
Price gain or loss		XXX
Total variance		XXX

Material usage standards can be developed through the help of the factory supervision and estimates can be superseded by keeping records on usage for a representative period of time, such as thirty days. Of course, the usage must be identified with the items, if there are more than one, and a real attempt must be made to determine that operating conditions are normal.

Labor standards are more difficult to establish than material standards. This item of cost is not so easy to measure. However, factory supervision knows approximate machine speeds and can readily furnish that data as a rule. In addition, there are often detailed time records giving actual production every one quarter hour and accounting for delay time, such as set up time and mechanical failures. Standards must be reasonable and care must be taken to set them as fairly as possible. They are a means, not an end. Low production is not always an operator's fault. Standards present an opportunity to ascertain causes. Labor variance may, in the initial stages with which this letter is concerned, be presented as follows in terms of hours (and may also be converted to dollars and a rate as well as efficiency variance disclosed):

Standard time X Actual pieces	XXX	
Actual time	XXX	
Labor variance—Hours gained or lost		XXX

In order to complete a standard costs application within the account structure, it is necessary to make a standard burden application. This can be done first without special refinement by establishing a ratio of indirect departmental or plant expense to direct labor. Through careful analysis of the over-all results, it can be determined whether the over-all rate (and variance), brought to management's attention each month is adequate.

The start with standard costs which has been suggested could be harmful if it were thought by anyone that the estimated standards were final. However, if this is kept in mind, difficulty is avoidable. Cost accountants can do more than is generally understood to assist management in controlling costs if they organize the facts at their fingertips into easily read and understandable reports. The reports must be timely and definitely newsy. Follow-up must be mastered to make sure the reports are interpreted properly. The cost accountant should contribute motive power to the enterprise.

ELMER H. BAKER, *St. Louis Chapter*

Explaining the Standard Cost System to Student Visitors

Editor, N. A. C. A. Bulletin:

We have received numerous requests from groups of college students to visit our plant and to have our accounting system explained to them. It is our feeling that a trip through the plant, under the escort of guides who understand the flow of material through the operations, definitely comes first. Naturally, we start from the point at which the raw materials are compounded and then follow the processing of the material in the several

departments until we arrive at the point at which finished goods are packed and warehoused. Through this first step, the visitors obtain a picture of the physical flow of the material through the operations and are better prepared to understand the accounting for the material, labor, and expense used in the process.

After the trip through the plant, we assemble the group in the company conference room and, by the use of the blackboard, we explain the flow of the same categories of material, labor and expense through the various accounts, placing particular emphasis on the use of variance accounts. We have found that "T" accounts are serviceable here and are easily understood by the students. When the "T" accounts have been established, we trace the material through each account, i.e., inventory, variance, goods-in-process and into finished goods. These flow charts in the form of diagrams are then related to the entire accounting system, including tie-in of the standard cost entries to the general ledger. In some cases, it might be advantageous to draw up flow charts with the appropriate explanations and have a number of copies mimeographed and distributed to the students for use during the explanation which might then be conducted with or without the help of a blackboard.

H. G. SHOEMAKER, *Jackson Chapter*

Factors in Variance Analysis in the Aircraft Industry

Editor, N. A. C. A. Bulletin:

Any productive organization that relies on a standard cost system is confronted with the factor known as "variance," i.e., the overall spread between the cost of production if figured at standard, compared to actual lot cost. No doubt many cost men feel they are currently treading unsafe ground with a standard cost system due to the continuous changing and fluctuating of the factors involved in the cost of a product. A lot cost system at actual, affords a month to month picture of these changes and fluctuations but the lines of this picture are obscurely drawn without means of comparison.

Variance, as the word implies, is a variation or difference between two specific things, in this case standard and actual cost. It should be borne in mind that actual cost is a total cost which reflects the money spent for production, regardless of the difficulties and abnormal conditions that may arise, while standard cost reflects production at normal efficiency under normal operating conditions. The most important elements contributing to overall variance in aircraft manufacture may be listed as:

1. Low and inconsistent rate of production
2. Rework
3. Scrapped work in process
4. Material substitutions
5. Shortages
6. Excessive loss of direct labor time due to conditions other than normal
7. Underabsorbed burden

1. *Rate of production*—This item could lead to a long discussion. However, the primary thought I wish to convey is that, in order to achieve

efficiency, each item or component part must be produced at a rate consistent with the type of manufacture required. The standard rate of production should be set on a ratio basis of setup time to run time. On items that have a high ratio of setup time to run time, the rate of production must be high to achieve standard efficiency, whereas, if the opposite is true and a low ratio exists, a lower rate of production will achieve the same efficiency toward meeting standard unit cost.

2. *Rework*—This is an item that has always plagued aircraft production, no doubt due to the highly technical type of manufacture and the development work carried on. Until a more stabilized production exists, excessive rework will probably remain which, in turn, constitutes a variance over standard. However, this does not mean that rework should run wild, because much can be done to control it and keep it at a minimum.

3. *Scrapped work*—This is similar in source to rework. Unless scrap value is substantial, scrapped items are a total loss in both material and labor and can only be charged off to variance. Improved tooling and careful workmanship will accomplish much from this standpoint.

4. *Material substitutions*—Non-Standard materials are conducive to higher cost, and inefficiency, due to the inexperience of labor with the new item and change of methods usually required to make a product under these conditions. Usually substituted material is of a larger size and dimension than the original, requiring more labor to complete the product, with an increased material cost.

5. *Shortages*—These increase variance in several ways. If a purchased item is on shortage, the situation may be temporarily remedied by emergency company production at a cost many times the original. Material shortages lead to material substitutions. Any kind of shortage causes delay, disruptions, extra activity, etc., which increases cost from both the direct and indirect point of view.

6. *Excessive direct labor*—New products, change of design in old production, change of production methods and tooling, all cause a temporary increase in direct labor costs above standard, that must be absorbed in variance. The turnover of production personnel is a definite element which pushes direct labor costs above standard efficiency. Another very important factor is the coordination of production schedules with production personnel. If this is not done efficiently, the shop load can become considerably out of balance with personnel (usually overstaffed), which can result in a heavy loss of production through slowdowns, idleness and personnel difficulties. Production is unlikely to be more efficient than production management.

7. *Underabsorbed factory burden*—includes all items of expense of an indirect nature that force the overhead rate above the standard rate established for cost purposes. Standard overhead is fixed at a percentage ratio of the standard direct labor required to operate a factory at normal capacity. This means that the standard direct labor must represent production at normal capacity before the standard

overhead rate is set. When production drops below normal capacity, the ratio of overhead to direct labor increases. When production climbs toward capacity, the same ratio decreases and overabsorbed factory burden may exist. This does not mean standard production efficiency unless direct labor is producing at standard at the same time. To get a clear picture, the volume variance must be separated from the remaining burden variance.

It seems to me that if an aircraft company can plan its operations on a year to year basis of production at standard efficiency and then accomplish that production with seventy-five per cent of standard, a job deserving of extra credit has been done. I think the industry as a whole is slowly developing toward standardized methods and techniques and that the segments of the industry engaged in direct competition to obtain the commercial and private market for its products are going to advance most quickly along these lines.

E. L. Feese, *Wichita Chapter*

Standards of Performance for Sales Deduction Accounts

Editor, N. A. C. A. Bulletin:

When standards costs and budgets are worked up for management approval, the cost accountant usually goes to great length and enlists much assistance to develop formulas and procedures to produce related standards of attainments for material, labor and overhead controls. These, of course, are the largest elements of cost and other items are perhaps rightly considered as nominal or inconsequential. On the other hand, it is just possible that cost accountants are overlooking a most important side of standard performance determination when they fail to give due consideration to the charges against the sales account.

The accountant is, of course, cognizant of the fact that sales represent the net amount after the sales returns, allowances, cartage, and discounts have been deducted from gross sales but he does not ordinarily furnish to his management reports on this subject of equal value to those furnished on the three major items of cost. However, the four sales-related debit accounts named do offer a field for control standards.

A comparison of the returned sales against standard or normal amounts would shed any needed light on causes of returns. It would show, among other things, direct information as to whether an unusual number of articles of substantial or inferior production quality were passing inspection. It is most important that the production management be furnished this information promptly.

If raw material substitutions have been made in accordance with engineering proposals or to maintain production due to scarcities, returned goods may increase or decrease in amount. An increase may be due to the fact that the material substitution will not maintain the standard of performance expected of the product. A decrease may be prima facie

evidence that the change of raw material has improved the life of the product or perhaps increased the sales appeal to the buying public. Any abnormal increase or decrease would, of course, be reflected in a variance from standard report on returned sales and corrective action could be taken at once.

Allowances are generally sales price offsets or lump sum amounts granted on a policy basis and include such items as rebates for quantity purchases or introductory allowances for initial purchases in a new territory. These are usually controllable and easy to analyze. However, other allowances, such as for breakage in shipment, spoilage and inferior or substandard articles which do not meet specifications, are sales account debits requiring constant supervision and analysis in addition to good internal control. For instance the shipping department would be the focal point of investigation if there should be an increase in breakage or spoilage in transit and the cost accountant is in a strategic position to be the first to report this variance, if there is a standard, to management.

The sales manager should establish the delivery policy and the f. o. b. shipping point basis, under which the cartage standards are established. Any variation in this account from standards may indicate a policy change regarding delivery and, while it may not be substantial enough to cause a change in standards, it should be considered in order to determine whether or not the billing department is following definite instructions or whether the order department is being governed by prescribed procedures.

Cash discounts are preferably considered in relation to the sales account and as a deduction, rather than as financial expense. Through the cash discounts taken analysis against standard amounts, the credit manager can better determine the economic condition of the various trade territories. Should the discounts increase, it should be regarded as an indication that more money is available for liability liquidation and a decrease would indicate an opposite condition. With that information at hand, the credit department would be in a better position to evaluate the trade credit as it applies to sections or the entire sales territory.

Some accountants will visualize an immense amount of detail work to obtain the information required to control sales debit accounts, but this is not necessarily true if standard costs are used. The usual accounting procedure will accumulate the information and the accountant must use his ingenuity to furnish the management with the reports of variance. This is the responsibility of the accountant. The standards established for any account supply only the information desired for a successful operation and the reports can only serve as a tool or guide for better performance.

A review of standard costs and budgets of many industries appears to indicate that cost accountants are overlooking a most important account when they fail to include the sales account debits among those subject to standards.

W. E. GUINN, *Fort Worth Chapter*

Bringing Packaging Materials Under Standard Costs

Editor, N. A. C. A. Bulletin:

Costing and cost control of the packaging of many hundreds of products in various package sizes, all bearing different printed copy, is a problem which has plagued many industries. Below is a description of the method, related to the material costs of packaging, which has answered the needs of our company.

MEMO TO COST DEPARTMENT
OF PACKAGING MATERIAL PURCHASES AT OTHER THAN
STANDARD PRICES

Item	Std. Cost	Invoice	O.K. Date	Use	Remarks

EXHIBIT 1

The first control to be noted in this system is that all purchases of any one of the two thousand pieces of packaging materials is checked against the standard cost as shown by the purchase record books. Any difference between actual and standard is written off to a purchase price variance account which is charged currently to cost of sales. The small mimeographed form shown in Exhibit 1 is forwarded to cost department on the last working day of the month as variance detail. All items showing variance are checked by the cost department as to the reason for the price change. These reasons for changes are also reviewed with the purchasing group so as to better ascertain market conditions which may be affecting purchases.

On this review will depend any decision to alter the standard purchase price of any item. It might be well to note here that many of our packaging materials have the same or nearly the same physical specifications and differ only as to printing copy, paper stock, or type of glass. These items are all carried under a group standard—which poses a special problem with respect to change of standards. Such changes, when required, are made on a weighted moving average basis. A record inventory is figured by the materials control group on all items on which the standard costs are being changed and this inventory is extended at the value of the difference between the old and new standard costs. The resulting difference found is charged to the purchase variance account mentioned above.

Packaging instructions are issued by the merchandise group in the form shown as Exhibit 2. These instructions are the basis for all packaging orders released to the finishing departments and no deviation from these

EXCERPT FROM STANDARD PACKAGING INSTRUCTIONS

Initial .....Revised .....X.....Special .....Date March 3, 1949
Item Fluid #491 Wild Cherry, for Making Syrup
SPANISH DO NOT PACKAGE IN TIN

S21SB
118 cm³—Package in a #21-S bottle, #327 screw cap, 1 Spanish label, white glassine wrapper 9¼ x 7¼".

S21S-12
12/118 cm³—Pack 12—#21-S bottles in a #393 corrugated box, seal top and bottom flaps with glue, 1 Spanish bottle label.

S500B
189.26 Litros—Package in a 51 gallon plain keg, 1 Spanish label, varnish the label.

NOTE—Plus a CQ-17 label placed beside the label at the lower right-hand corner of the label.

P.S.—Changed from AQ-7871 label. Memo 2-25-49 (RMR)

EXHIBIT 2

instructions is allowed without written authorization from the merchandising group. The cost department uses the standard packaging instructions in setting up the standard packaging material cost card which is shown as Exhibit 3 and which combines the standard costs of the various pieces of packaging material used in any finished package. These standard packag-

STANDARD PACKAGING MATERIAL COST CARD

PACKAGE FOR 21-S BOTTLE

CONTAINING

ARTICLE	No.	Quantity	3-3-49
BOTTLES VIAL COLL. TUBE JAR TIN CAN. FIBRE CAN	21-S	100	481
SCREW CAP CORK AND CORK TOP	327	100	121
CARTON	9¼x7¼	100	92
PAPER TUBE BOTTLE WRAPPER	393	100	984
BOX			
CORR. WRAPPER END PIECE			
SHELF CARTON BOX			
TOTAL COST PER 100			1678
UNIT COST EACH UNIT COST DOZ.			.168

EXHIBIT 3

LIST OF STANDARD PACKAGING MATERIAL COSTS
Effective March 1, 1949

Bottle Number	Packaging Cost Each
1	.078
2A	.201
3	.223
4C	.171
5	.098
18	.320
19	.322
21S	.168
22	.510
23	.432
25S	.641

EXHIBIT 4

ing material costs are listed on a typewritten schedule like that in Exhibit 4 and distributed to the cost clerks for application to the cost product sheets.

The above system has been in operation for eleven years and has yielded us accurate and useful results. It requires only a minimum amount of effort to maintain and apply packaging material costs. However, it has been our experience that a certain amount of effort should be directed at the checking of the controls that have been established. The extra work of reviewing controls is necessary, due to the fact that so many groups of products are affected and that new purchasing policies or newly-purchased items may not be covered by the system if it is not kept up to date.

J. C. WOOLERY, *Indianapolis Chapter*

RESEARCH REPORTS PUBLISHED IN THE N.A.C.A. BULLETIN, APRIL 1, 1943, TO DATE

Research Series No.	Title	Date	Sec.
1.	Practice in Accounting for Continuing Expenditures Arising from Wartime Production.	Apr. 1, 1943	3
2.	Practice in Accounting for Nonrecurring Expenditures Arising from Wartime Production.	Apr. 15, 1943	3
3.	Practice in Depreciating and Amortizing Investment in Machinery and Equipment.	May 1, 1943	3
4.	The Cost of Reconversion.	Feb. 1, 1944	3
5.	Accelerated Amortization Under Certificates of Nonnecessity.	June 1, 1945	3
6.	Accounting Problems Arising from Tax Amortization of Emergency Facilities.	Jan. 1, 1946	2
7.	The Uses and Classifications of Costs.	May 15, 1946	2
8.	Postwar Practice in Accounting for Emergency Facilities.	Nov. 15, 1946	3
9.	Trends in Cost Control.	Mar. 15, 1947	3
10.	Costs Included in Inventories.	Aug. 15, 1947	3
11.	A Reexamination of Standard Costs.	Feb. 1, 1948	3
12.	Standards to Aid Control of Manufacturing Costs.	Mar. 15, 1948	3
13.	Standard Costs for Costing Inventories.	June 1, 1948	3
14.	Standard Manufacturing Costs for Pricing and Budgeting.	Oct. 1, 1948	3
15.	A Standard Cost Case Study.	Dec. 15, 1948	3
16.	The Variation of Costs with Volume.	June 15, 1949	3
17.	The Analysis of Cost-Volume-Profit Relationships.	December 1949	3
18.	The Volume Factor in Budgeting Costs	June 1950	3